TRIAL OF THE JAPANESE APPROVALS PROCESSES FOR RESIDENTIAL BUILDING PRODUCTS

Alberta
MUNICIPAL AFFAIRS
Innovative Housing Grants Program

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March 1986

Prepared by Jager Industries Inc.

The views and conclusions expressed and the recommendations made in this report are entirely those of the authors and should not be construed as expressing the opinions of Alberta Municipal Affairs.

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FOREWORD

The project documented in this report received funding under the Innovative Housing Grants Program of Alberta Department of Housing. In May 1986 the Alberta Department of Housing was amalgamated with Alberta Municipal Affairs which is now responsible for issuing this report.

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As the type of project and level of resources vary from applicant to applicant, the resulting documents are also varied. Comments and suggestions on this report are welcome. Please send comments or requests for further information to:

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TABLE OF CONTENTS

PAGE NO.

List of Tables.................................. ii
List of Figures................................. ii
Executive Summary............................... iii

1.0 Introduction.................................... 1

2.0 Trial Shipment and Identification of Requirements............................... 4
  2.1 Japanese Approval Process and Standard for Lumber................................ 4
  2.2 Identify and Test Anti Stain Treatments Required.............................. 13
  2.3 Package Shipment............................ 17
  2.4 Transport Alternatives and Costs........... 18
  2.5 Japanese Customs, Handling and Treatment of the Product to the Building Site........ 21
  2.6 Material Handling Practice and Construction Techniques............................... 22
  2.7 Japanese Lumber Market..................... 23

3.0 Japanese Approval Requirements.................. 27
  3.1 Japanese Laws and Regulations.............. 27
  3.2 Fees and Time Required Pertaining to Processes................................. 28
  3.3 Government Officers, Firms and Test Labs Involved in the Process.................... 31

4.0 Conclusion...................................... 35

Appendix A: Japanese Agricultural Standard (JAS) for Structural Lumber.................... A1 - 46
Appendix B: Outline of Technical Appraisal System... B1 - 23
Appendix C: JAS Structural Plywood.................. C1 - 20
Appendix D: JAS Test Method for Plywood............. D1 - 5
Appendix E: JAS Common Plywood and Commentary....... E1 - 85

LIST OF TABLES

PAGE NO.

Table 1: 2 x 4 Home Builders in Japan 3

Table 2: Guidelines for Japanese Canadian Lumber Standards 6

Table 3: 2 & Better and Standard & Better 7

Table 4: Standard Grading Rule of Dimension Lumber for Internal Use of a Japanese Company 8

Table 5: Telex Quantifying Sanwa Grading Rules ... 11

Table 6: Dealer Asking Price of Canadian Dimension Lumber 24

Table 7: 2 x 4 Market Price Movement - August 1985 25

Table 8: Evaluation Committees 33

LIST OF FIGURES

Figure 1: Automatic Dip Tank 16

Figure 2: Flow Chart of Evaluation Authorization .. 30

EXECUTIVE SUMMARY

The objective of our project was to investigate the Japanese building code approval process as it applies to Alberta produced building products. At the time the project began in April 1985, Jager Industries Inc. and Sanwa Home Inc. (Tokyo) had agreed to form an Alberta company, Jager-Sanwa (Alberta) Inc., which would export Alberta building technology and materials (including Jager's technology and products) to Japan and distribute them to Sanwa and other homebuilders. Sanwa is a medium size homebuilder (1000 units in 1985) which had recently switched from the traditional to the 2x4 method of house construction. Sanwa had developed a successful marketing program based on citing an Alberta connection and was anxious to use Alberta products in their homes whenever possible and practical. Sanwa's initial priorities were to ensure a reliable source of lumber of the desired quality; so our initial efforts concentrated on translating the lumber quality requirements into grading rules which could be understood by Alberta sawmills. On two occasions, Sanwa sent people to Alberta to regrade dimension lumber to their standards and in both cases, the lumber was shipped to Japan. Jager sent people to Japan in both cases to reinspect the lumber and to learn more about the process of code approvals.

One significant discovery was that all building materials must bear a J.A.S. stamp (Japan Agricultural Standard). The J.A.S. stamp is only available to builders or suppliers who operate a plant in Japan and they must bear the responsibility for products which they stamp. Since Sanwa Home did not have a J.A.S. certified plant, our whole project was put on hold until such time they could buy or build a plant and obtain the J.A.S. certificate.

Due to the relationship between Jager and Sanwa, it was not appropriate for Jager to talk to other Japanese builders or suppliers, so almost all of the information we gathered was through Sanwa. As a result, we have not completed our objectives to the extent contemplated. We did however, gather much valuable information which may be useful to Alberta sawmillers/wholesalers and building products manufacturers who may wish to explore alternate avenues of distribution to Japan. Whatever avenue of distribution you choose, in the end your products must go through a J.A.S. certified plant for distribution in the Japanese market. The J.A.S. plant must accept the responsibility for those products so you (or the importer) must convince them of the quality and reliability. The Japanese generally seek long term relationships so they want to thoroughly check out your commitment to supply the market. These relationships take time to develop and the Japanese business system can become frustrating to North American businessmen who are accustomed to making deals fairly quickly. You are better off to work through experienced exporters or Japanese importers unless you are ready to commit time and patient persistence.

The market is large (1.1 million housing starts per year) and the Japanese are receptive to North American housing products and technology as they are trying to emulate the North American lifestyle. The so called "2x4" method of building houses conjures up images of North American lifestyle as well as a building technology. The highly industrialized factory built housing method appears to have peaked, probably due to low profit margins and the traditional method (post and beam) is declining (probably due to highly skilled labor requirements). The "2x4" method is growing rapidly and being encouraged by the government through favorable financing. The Japanese are under intense pressure to open up their markets and their tendency is to yield ground in areas where they can still add value in Japan. Primary and secondary forest products and some other building products fit well into this plan. Highly manufactured products usually need more adaptation before they are suitable to the Japanese market.

There appears to be no insurmountable obstacles provided you are competitive, committed for the long haul and willing to adapt your products to their market needs. The system is in place however, to stop you short if you are uncommitted or if your product may harm their local industry.

1.0 INTRODUCTION

The purpose of this study was to investigate and test the procedures for securing Japanese regulatory approval of selected Alberta residential building products and to identify ancillary obstacles to penetration of the Japanese market.

The perception that Japan is a closed market, protected by an array of tariff and non-tariff trade barriers, language and cultural differences, as well as the apparent transportation disadvantage faced by Alberta building materials suppliers compared to their counterparts on tidewater, have been sufficient reason for most Alberta companies to ignore Japan and other Pacific Rim markets.

Our investigation was focused through Sanwa Home Inc. of Tokyo. Sanwa was a builder of traditional homes when we met them in 1984. They had grown to about 600 units per year and became interested in the "2x4" method of construction which was growing in Japan. The "2x4" method, as it is known in Japan, is typical platform frame construction common in North America and is also synonymous with North American lifestyle which many Japanese wish to emulate.

Sanwa executives made several trips to Canada to investigate "2x4" technology and through Alberta Housing were introduced to Jager Industries Inc. They became very interested in prefabricated components (roof trusses) which Jager had helped pioneer in the Canadian market in the early 60's and also the more recent introduction of Wood I Beams.
At the same time, they were introduced to Oriented Strand Board (OSB) from Pelican Mills, Edson Alberta, which Jager uses as the web for its I-Beam. Sanwa

came to view Alberta as the spawning ground for new technology in the evolution of the "2x4" method of building. Since Jager was also a homebuilder with connections to a variety of suppliers, they sought to establish closer connections. In 1985 they completely dropped the traditional (post and beam) method of construction, switched to the "2x4" method and heavily advertised their connections in Alberta. As a result they sold 1,000 units in 1985.

As their first priority, ahead of trusses or I-Beams, was to find reliable sources of lumber we focused our investigation on primary forest products. During this process, we gathered information which would be applicable to a variety of building products or components. We sent two trial shipments of lumber, graded to perceived Japanese requirements and tested a new anti stain chemical, learned the most economic methods of shipping bulk materials to Japan from Alberta and discovered some of the non-tariff trade barriers.

As our main source of information was Sanwa Homes some of our findings must be considered unverified. Our relationship with Sanwa made it inappropriate to talk to other builders or Japanese importers. At times it appeared to us that Sanwa was inconsistent. This may have been because the "2x4" method was new to them and they were also learning about the materials distribution system and the approval process in their country.

Table #1 lists the major 2 x 4 builders in Japan to provide a perspective on the status of 2 x 4 construction in Japan and Sanwa's place in it.

TABLE #1

2 X 4 HOME BUILDERS IN JAPAN

NO.	COMPANY NAME	OFFICE	UNITS BUILT IN 1984	ESTIMATE UNITS IN 1985	+ - RATIO
1	Mitsui Homes	Tokyo	5,342	6,000	112.3
2	Taisai Const.	Tokyo	930	1,000	107.5
3	Taihei Homes	Tokyo	924	2,000	216.4
4	Iwatani Mfg.	Osaka	865	1,000	115.6
5	Sanwa Const.	Tokyo	843	1,200	142.3
6	Sekisui House	Osaka	825	1,000	121.2
7	Eidai Mfg.	Osaka	802	1,000	124.6
8	Tokyu Realty	Tokyo	746	930	124.6
9	Kinoshita Const.	Tokyo	615	747	121.4
10	Daiken Industries	Osaka	590	600	101.6
11	Saibu Realty	Tokyo	460	500	108.6
12	Dai-Ichi Woodwork	Tokyo	446	410	91.9
13	Daiei Homes	Nagoya	410	450	109.7
14	Plec Homes	Hiroshima	350	430	122.8
15	Sumitomo Realty	Tokyo	323	850	263.1
16	Shin-Showa Homes	Chiba	315	385	122.2
17	Kumada Const.	Kobe	305	335	109.8
18	Kanebo Housing	Tokyo	300	500	166.6
*19	Sanwa Homes	Tokyo	290	1,000	344.8
20	Kintetsu Homes	Kanazawa	253	335	132.4
21	Tokyu Const.	Tokyo	250	320	128.0
22	Nippon Homes	Tokyo	230	300	130.4
23	Akita Ind.	Akita	230	230	100.0
24	Neo Homes	Takamatsu	220	345	156.8
25	Heian Const.	Kyoto	220	240	109.0
26	Sekisui Chem. Ind.	Osaka	200	400	200.0
27	Fujiwa	Tokyo	197	270	137.0
28	Shokusan Homes	Tokyo	187	250	133.6
29	Nissei Build Ind.	Kanazawa	162	200	123.4
30	Nomura Realty	Tokyo	153	175	114.3
			======	======	=====
			17,983	23,402	130.1

Source: Nikkei Shohin Joho 85.6.10

2.0 TRIAL SHIPMENT AND IDENTIFICATION OF REQUIREMENTS

2.1 JAPANESE APPROVAL PROCESS AND STANDARD FOR LUMBER.

2.1.1 Official Japanese Standards.

The official Japanese standards for lumber are issued by the Minister of Agriculture, Forestry and Fisheries under the heading "Japanese Agricultural Standard (JAS) for Structural Lumber for Wood Frame Construction" SIS-4, March 1983. Translated by Japan External Trade Organization (JETRO), it is included as Appendix "A" of this report. We note that lumber used in home construction is the "A class 1st grade framing lumber".

2.1.2 Operational Standards for Consumers.

There are no written operational standards for consumers, although reportedly consumers do in effect set standards by their expectations. Sanwa told us that the lumber shipped to Japan from B.C. and Oregon mills is typically run through a precut plant in Japan. The precut plant usually rejects 20% of it. This 20% must be upgraded by cutting out defects. In the end 4% is lost.

It is expected that the B.C. mills are following the Guidelines for Japanese Canadian Lumber Standard (CLS) Table #2. A comparison of how this varies from National Lumber Grading Authority (NLGA) is shown on Table #3. We also obtained a document called Standard Grading Rules of Dimension Lumber for Internal Use, Table #4, which is the requirements of another Japanese home component company.

We attempted through our first trial shipment to Sanwa to determine what grading rules to follow in order to achieve zero rejects (to make it unnecessary to cut out defects). These rules are outlined in Table #5. This worked reasonably well on studs, but when extended to the second shipment of random length, there appeared to be a change in the rules, although this was denied.

TABLE #2

GUIDELINES FOR JAPANESE
CANADIAN LUMBER STANDARDS

	#2 Structural and Better			Standard and Better	
Compression Wood	None in readily identifiable and damaging form			Same	
Grub Worm Holes	None			"	
Pin Worm Holes	10 per 2'			"	
Sapstain	Light 20% volume-10% of pcs.			"	
Heartstain	Light 50% volume-10% of pcs.			"	
Unsound wood	None			"	
White specks	None			"	
Pockets	1 square inch			"	
Warp (Crook, Twist, Bow)	.2% of the length			.3% of the length	
Slope of grain	1 in 8			1 in 4	
Shake - on ends	Max. ½ thickness			Same	
- not through	2'			"	
- through	2'			"	
Splits	Width of pce.			"	
Torn grain	Max. 1/8" deep			"	
Skip	Hit & Miss - 30% of surface			"	
Wane	1/3 width x 1/3 thickness full length			"	
Spike knots	1/3 displacement			1/3 displacement	
Knots	Wide Face Firm and Tight		Holes *	Wide Face	
	Edge	Centre	Unsound	Firm and Tight	Holes *, Unsound
2 x 3	7/8	7/8	7/8	1½	1
2 x 4	1¼	2	1¼	2	1¼
2 x 6	1-7/8	2-7/8	1½		
2 x 8	2½	3½	2		
2 x 10	3½	4¼	2½		
2 x 12	3-3/4	4-3/4	3		
4 x 4	2	2	1¼		
	* Holes, 1 in 2'				

TABLE #3
2 & BETTER AND STANDARD & BETTER

Substantially Different	More or Less the Same	NLGA *	Japanese ** Requirements
Pockets		Not Limited	1 square inch
Skips		Hit & Miss 5% of pos. 1/16" Full Length(1/8"x2')	Hit & Miss 30% surface 1.5mm
	Slope of Grain	1 in 8 2 & Btr 1 in 4 Stand & Btr	Same as NLGA
	Splits	1 1/2 x width of piece	Width of piece
Sapstain		Not Limited	Light 20% Volume 10% of pieces
Heartstain		Not Limited	Light 50% Volume 10% of pieces
Wane		1/3 Thickness x 1/3 Width Full length 5% of pieces 2/3 Thickness 1/2 Width for 1/4 Length	Same
Warp		Light	1/2 of NLGA
	Compression Wood	Not Permitted in Readily Identifiable and Damaging Form	Same as NLGA
	Shake on Ends	Max 1/2 thickness	Same as NLGA
	Through	2'	Same as NLGA
	Not Through	3' up to 1/4 length	2'
White Specks		Firm 1/3 Face	None
Honeycomb		Firm 1 1/16 Width x 2'	None
	Checks	Surface Seasoning Not limited Through checks Same as Shake or Splits	Same as NLGA
	Unsound Wood	None	None
	Knots	Various	Same as NLGA

* JAS 600 Grading Rules for "2x4 lumber" only differs from NLGA with respect to; White Specks, Honeycomb disallowed in Stand and #2; skip tolerances = 1.5mm; shake measured different.

** Predominantly reflects requirements of a major Japanese 2x4 home builder; others may differ.

Source: NLGA, COFI, CLMA

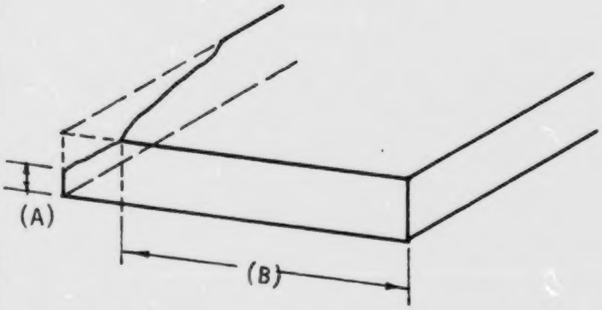
TABLE #4

STANDARD GRADING RULE OF DIMENSION LUMBER FOR INTERNAL USE OF A JAPANESE COMPANY

	Structual Joists and Planks				Light Framing		
	No. 2				Standard		
	Wide Face			Thickness side	Wide Face		Thickness side
Knot Hole (Unit: mm) Size	Knots		Hole	Knot Hole	Knot	Hole	Knot
	Edge	Center					
2 x 3	22	22	22	13	38	25	23
2 x 4	32	51	32	13	51	32	22
2 x 6	48	73	38	13			
2 x 8	64	89	51	13			
2 x 10	83	108	64	13			
2 x 12	95	121	76	13			
4 x 4	51	51	32		51	32	
Group Knot NBP of Hole (Worm Hole, Pinhole)	Double above figures or less max. 1 hole per 60cm.				- ditto - Max. 1 hole per 60cm.		
Spike knots entirely across face	1/3 or less				1/3 or less		
Unsound wood	Slight				Slight		
Stain	Slight				- ditto -		
Wane	1/3 thick 1/3 width				- ditto -		
Splits & shake Splits: Shake : Both side One side	 1.5 or less of width 60cm or less 90cm or less				 1.5 or less of width 60cm or less 90cm or less		
Manufacturing imperfection	No trouble for use				No trouble for use		
Crook	0.13%				0.3%		
Crook of stud					2.5mm or less		
Bow or twist	Slight				Not conspicuous		
Average annual ring width	6mm or less				- ditto -		
Slope of grain	120mm or less				250mm or less		
Other defects	No trouble for use				- ditto -		

TABLE #4 continued

1) Wane



1. Thickness

(A) Should be no less than 30 mm

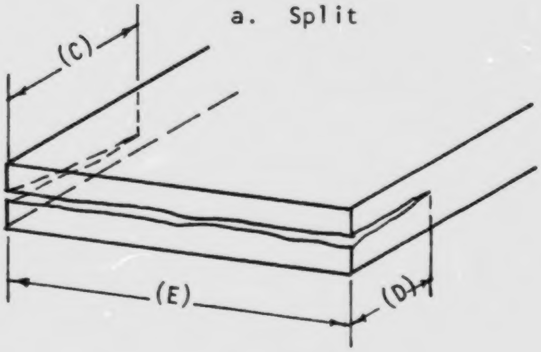
2. Width

(B) Should be no less than

60mm	for	2 x 4
95mm	for	2 x 6
127mm	for	2 x 8
160mm	for	2 x 10

2) Fissures

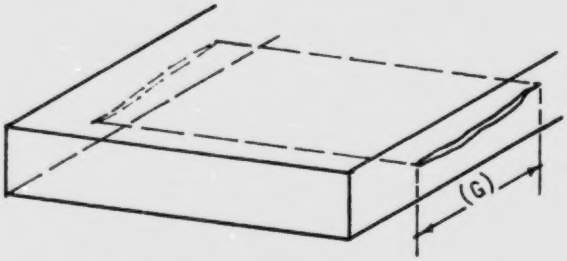
a. Split



$$\frac{(C) + (D)}{2} \leqq 1.5 \times (E)$$

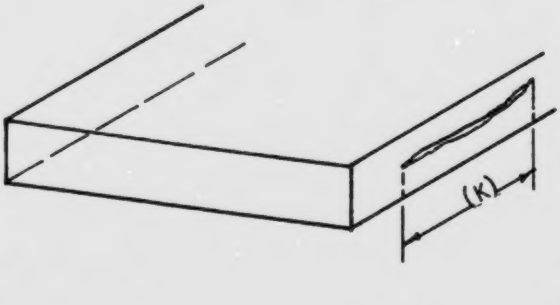
Average linial length should be not more than 1.5 times of width.

b. Split



(G) Should not be more than 6000mm at the longest.

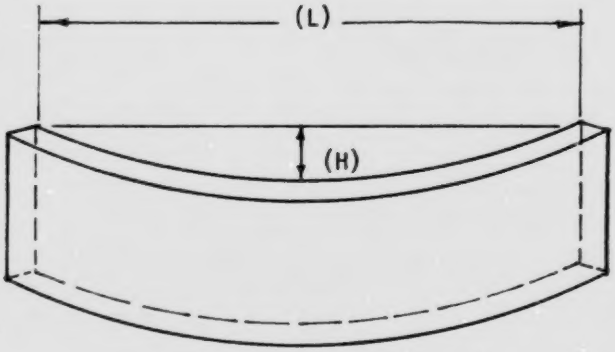
c. Other Shakes



Length of (K) should not be more than 900mm at the longest.

TABLE #4 continued

3) Crook, Spring



$$\frac{H}{L} \times 100 \leqq 0.13\%$$

Length	10'	(H) must be under	4mm
	12'	- " -	5mm
	14'	- " -	5.5mm
	16'	- " -	6mm
	18'	- " -	7mm
	20'	- " -	8mm

TABLE #5

TELEX QUANTIFYING SANWA GRADING RULES

18 Sep 85

TELEFAX 03-982-5100

SANWA HOME INC.

TOKYO JAPAN

ATT.: MR. MORIKATSU INOUE

The second lumber trial shipment will be graded based on the results obtained during the grading of the first shipment from Erith Tie Co. Ltd. The 95% acceptance was also considered in establishing the various criteria.

Accordingly the grade requirements are:

1. All the pieces will satisfy the appropriate North American lumber grade as defined by the NLGA grading rules. This is a basic requirement.

2. In addition each piece will demonstrate equal or better quality as defined by the following properties and criteria:

Wane	0.28" (D)	x 19.75"	(L)
	7.1mm (D)	x 502 mm	(L)
Knot		1.1"	(0)
(Edge and regular)		28mm	(0)
Twist		0.21"	
		5.33mm	
Pitch	0.75" (W)	x 12.25"	(L)
	19mm (W)	x 311mm	(L)
Bow		0.26"	
		6.60mm	
Pocket	0.18" (W)	x 8.10"	(L)
	4.57mm (W)	x 206mm	(L)
Crook		0.224	
		5.60mm	
Too many knots		19 knots or more	
Shake		9.75"	(L)
		248mm	(L)

Planer Skip	0.08" (W) x 13.90" (L) 2mm (W) x 353 mm (L)
Fungal Stain	75%(S) or less stained area
White Specs	None 0% (S)
Rot	0.70" (W) x 6.75" (L) 18mm (W) x 171mm (L)
Thorn Grain	2.5" (W) x 11.5" (L) 635mm (W) x 292mm (L)
Pin Hole	38 pin holes or less

Legend:

D = Depth
L = Length
O = Diameter
W = Width
S = Surface
% = Percent
" = Inches
mm = Millimetres

Please review and acknowledge or comment as necessary.

2.2 IDENTIFY AND TEST ANTI STAIN TREATMENTS REQUIRED.

Treatment is required by the Japanese to eliminate the development of fungus on the wood during ocean shipment and storage. There is no prescribed chemical formula that must be used; anything that does the job will suffice. The prevalent anti-stain treatment in evidence is (NaTCP) sodium tetrachorophenate, which has been the industry standard. However, the wood treated in this way becomes discoloured. The treatment from Aditi Research, which was used in the trial shipment, is clearly superior for two reasons: the treatment is non-toxic and is thereby safe for workers and the environment, and, the treatment preserves the natural colour of the wood. Sanwa Home Inc. did not seem concerned with the toxicity of the alternative treatment; however, they were very pleased with the natural colour which characterized the sample treatment.

The first trial shipment was stripped and dipped into a vat containing the Aditi solution. This is not a recommended method as it is inefficient. However a few minutes in the solution resulted in a treatment which worked successfully (i.e. the lumber did not turn black on its journey).

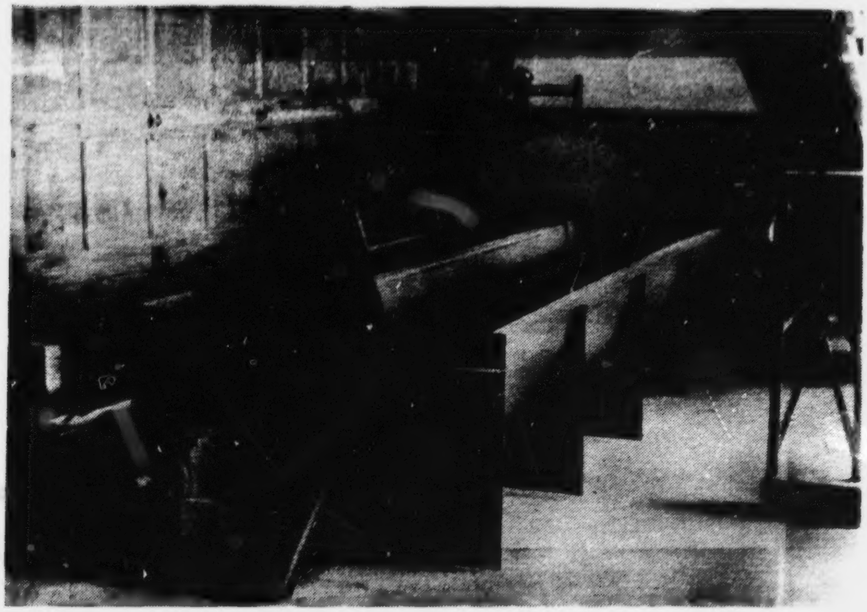
The second shipment was treated with the same solution but the process used an "automatic dip tank" specially constructed by Jager Industries Inc. (see attached photo - Figure #1 on page 16). The 2x4's were automatically fed sideways into the notches on the wheels. The wheels slowly turn, carrying the lumber through the solution for a duration of 30 seconds. They are automatically ejected on the other side and sent to an automatic stacker (also constructed by Jager Industries Inc.)

In the second shipment, three different treatment levels were tried (varying amounts of anti-fungicide). Some were run through twice. All performed equally well.

Another experiment was conducted with the treatment chemical (which is 98% water) to assess required dip times and the affect on frozen lumber. Some of the chemical was colored with a dye. Pieces of 2x4 were placed in it for periods ranging from 15 seconds to 5 minutes. Some were frozen pieces and some were at room temperature. The pieces were then cut and examined. There did not appear to be any perceptible difference in how far the colored solution penetrated the lumber. On all pieces, it penetrated approximately 1/16" on the faces and 3/8" on the ends. This leads us to believe it may be possible to speed up the "automatic dip tank" to 36 pcs/min and alternately that the solution can possibly be applied satisfactorily using the "spray" methods presently used in some sawmills to apply anti-stain chemicals.

It is worthwhile to note that the lumber industry is currently seeking an alternate treatment to the present highly toxic material NaTCP because of its dioxin impurities and tight supply. Forintek Canada Corporation is currently studying eleven alternate chemicals. It is not known at this time how the Aditi chemical will compare with the other eleven chemicals. Our successful use of the Aditi chemical on two trial shipments was certainly not conclusive proof of effectiveness in all weather conditions or over extended periods of time, but is an encouraging indication.

FIGURE #1
AUTOMATIC DIP TANK



2.3 PACKAGE SHIPMENT.

Loading lumber into containers requires special bundle sizes in order to maximize the load and minimize the cost of transport.

We found the most economical solution was to use 40 ft. containers rated at 60,000 lbs. This means you can have a payload of 25 metric tonnes (55,000 lbs). Since dry Alberta SPF usually weighs 1600-1800 lbs per thousand board ft., this means you should be able to ship between 30,000 and 34,000 board ft. in a container.

We were told that these heavy 40' containers would be readily available provided that there was either a regular demand or some reasonable notice given. Other special containers such as extra height or open top containers would be difficult to count on. This means the containers must be end loaded and the bundle size is restricted by the door size. The door is 90" wide which requires that your bundles of 2x4 be no more than 12 wide permitting two bundles or 24 pcs. in width.

The height of the door is normally 92". We found we could comfortably go three bundles high with each bundle containing 18 pcs. high, and 2x4 blocks between bundles.

The inside length of the container is 39'6". As dimension lumber comes in increments of two feet, the maximum length that can be used is 38 feet. If possible the loads should be planned so that the full 38' is used. This can be achieved with, for example, the following length selections on the left side of the container 8', 8', 10', 12' = 38' and on the right side, load 12', 14', 12' = 38'.

Another example would be:

left side - 16', 14', 8' = 38' and

right side - 14', 14', 10'= 38'.

Our fully loaded container now has 2 bundles wide, 24 pcs and 3 bundles high = 54 pcs:

24 x 54 = 1,296 times 38 ft.

= 49,248 lin ft. or

= 32,832 bd. ft.

This is a legal load for the container provided our lumber weighs no more than 1675 lbs/thousand bd ft.

2.4 TRANSPORT ALTERNATIVES AND COSTS.

On January 1, 1986 the Alberta Government established a Crown Corporation, Alberta Intermodal Services, which established container ports in Calgary, Edmonton and Vancouver. They negotiated a long term contract with CP Rail with a view to reducing the cost of carrying marine containers between Alberta and Vancouver.

Mills in B.C. do not have this alternative. They must truck their lumber to Vancouver from as far away as Prince George. The lumber is then stuffed into containers in Vancouver and the containers loaded on ships.

This is an alternative for Alberta mills as well, but the cost of trucking to Vancouver appears to be higher than the combined cost of trucking it back to Calgary or Edmonton where it would be loaded into containers and railed to Vancouver.

It does not appear to be practical to load the containers at the mill as the heavy containers cannot be hauled over the road legally except with specialized equipment. Also this would require dock level loading facilities at the mills in order to efficiently load the containers from the end.

The possible disadvantage at the moment is the lack of service and facilities in Calgary and Edmonton which are specialized in loading lumber into end load containers. These facilities are not expensive or complex, so it should not be difficult to encourage their establishment if any volume is demonstrated. In Vancouver, it costs $100-150 to have the lumber stuffed into a container.

Ideally these facilities would be established right at the container port in order to prevent possible problems hauling heavy containers over the road and this would also reduce the cost of spotting and picking up containers. One company quoted us $126.00 just for spotting the container and picking it up at a distance of less than five miles.

The present cost of shipping a 40' container to Vancouver from either Calgary or Edmonton via Alberta Intermodal Services is $526.00. This cost is the same for a light 40' container or a heavy one (25 metric tonnes). The cost of spotting and picking up containers can vary considerably. A local situation with volume movement could be had as low as $40.00. This could run to several hundred at a remote mill site. Also to be added is $99.00 terminal service charges. It should be noted this charge is the same whether the lumber is trucked to Vancouver terminals or handled through the Calgary or Edmonton container ports. Another cost is stuffing the containers ($100-$150) but this should be similiar in Vancouver or in Calgary-Edmonton. Also to be considered is the cost of trucking the lumber to Calgary or Edmonton.

Ocean shipping costs are quoted in US dollars and are quite competitive at this time on the Pacific. We were able to obtain a rate of $500.00 US for Vancouver-Tokyo per container.

Marine insurance rates we received varied between $.34 and $.60 per $100.00 declared value.

Other transportation costs are normally paid by the importer. They include unstuffing the container, customs clearance and bonded warehousing. Containers of this weight and size cannot be delivered in Japan and must be unloaded at the container terminal. Typical charges are 2200 Yen per cubic meter including up to 10 days storage. Customs inspection, if necessary, would cost approximately 8000 Yen. Local delivery would be extra.

There are several freight forwarders in Calgary and Edmonton which can provide complete services necessary for shipments to Japan. They will provide the export documents, arrange for containers, pickup, delivery, stuffing, insurance. There appears to be wide discrepancies in their rates, so it pays to shop. Some may not have the same access to heavy containers. Similiar services exist in Vancouver.

2.5 JAPANESE CUSTOMS, HANDLING AND TREATMENT OF THE PRODUCT TO THE BUILDING SITE.

Once the product arrives in Japan, the importer files an Import Declaration. It usually takes three days for clearance. Once cleared the shipment can be off-loaded. If a bonded warehouse is used, the shipment can be off-loaded in the warehouse prior to clearance. Assuming the container is small and light enough to be delivered within Japan and contains a single type of item, unstuffing for inspection may not be required. If all the paperwork is in order, the Japanese customs officers will merely verify the goods, match the bill of lading and the process goes smoothly.

The goods would then normally be delivered to a plant which is certified by J.A.S. (Japan Agricultural Standard). The plant would normally be owned by the company which has purchased your goods, as the plant must accept the responsibility for quality control and product performance. In the case of lumber, these plants would normally provide precutting (to the lengths required in Japan) and regrading services and delivery to the site in specified quantities. Materials without the JAS stamp can only be used in conventionally financed buildings, which carry mortgage rates of 8 to 9%. A mortgage rate of 5.5% can be obtained from the Japanese Housing Loan Corporation, but this requires all material to be JAS stamped.

2.6 MATERIAL HANDLING PRACTICE AND CONSTRUCTION TECHNIQUES.

Our experience was in the Tokyo area and accordingly the comments which follow are observations from this viewpoint.

As most of the new home construction is actually reconstruction, where the old home is demolished, it is common for the building site to be very congested. Often the roads leading to the building site are very narrow. As a result, deliveries are normally handled in small quantities and with small trucks. Material is off-loaded by hand. It is not uncommon for a site crew to consist of only one man. Usually the same carpenter who does the framing will also do the finishing.

Construction techniques on 2x4 homes are similiar to our platform frame construction in some regards but differences do exist. Stud spacing is 455 mm (17 7/8"). Plywood sheeting on the walls is placed vertically to ensure that all joints occur on studs which results in greater shear strength for better earthquake resistance. Sheets are only 3' wide. Solid blocking is used between joists at every interior wall as a means to retard flame spread in the event of a fire. Exteriors are normally stucco and roof material is clay tiles as these reduce the risk of fire spread between buildings. Conventional roof framing (rafters and ceiling joists) is still common. Nails have color coded heads so inspectors can verify the correct size nails have been used. Single pane aluminum windows are most common. There is no central heating. There are no basements. Normal insulation is 2" fiberglass.

Fingerjointed finishing materials are not uncommon. Framing lumber is an excellent appearance grade. Blocking between joists and studs contains more defects. Most houses are two storey.

2.7 JAPANESE LUMBER MARKET.

2.7.1 Retail Market. Table 6 shows the list of lumber prices. Table 7 shows the market price range and movement in various parts of Japan over the last two years. The market prices include delivery on site with all precut charges according to the builders plans and specifications. It appears that the retail lumber market in Japan is fairly stable at a high level of price.

2.7.2 Wholesale Market. The wholesale market more closely tracks the US market. It appears wholesale prices expressed in Yen have dropped substantially in recent months as the Yen has appreciated relative to the US dollar. Most sales occur in US dollars per thousand board feet. Importers will convert to Yen per cubic meter. In mid February 1986, the wholesale price CIF (contents insurance freight) Tokyo for SPF dry 2x4 random length, anti stain treated, was $260.00 US per thousand board feet. Backing out freight, insurance, brokerage etc., indicates that the net back to a North American mill was perhaps 10% better than selling into the US. The duty rate is 10% on SPF and is normally paid by the importer. We have not yet obtained our copy, but we recently learned that Random Lengths publishes an Export version of their newsletter which tracks export prices.

TABLE #6

DEALER ASKING PRICE OF CANADIAN DIMENSION LUMBER
Yen per m^3

		High		Low
2x4	Hem Fir (G)	59,000	-	57,000
	Hem Fir (KD)	67,000	-	65,000
	SPF (KD)	70,000	-	68,000
2x6	Hem Fir (G)	58,000	-	57,000
	Hem Fir (KD)	67,000	-	65,000
	SPF (KD)	70,000	-	65,000
2x8	Hem Fir (G)	58,000	-	57,000
	Hem Fir (KD)	67,000	-	65,000
	SPF (KD)	70,000	-	66,000
2x10	Hem Fir (G)	63,000	-	62,000
	Hem Fir (KD)	71,000	-	70,000
	SPF (KD)	75,000	-	70,000
2x12	Hem Fir (G)	70,000	-	68,000
	Hem Fir (KD)	78,000	-	74,000
	SPF (KD)	84,000	-	79,000

Notes: - Covers period December 1983 to March 1985

Source: Prepared by Alberta office in Tokyo

TABLE #7

2x4 MARKET PRICE MOVEMENT - AUGUST 1985

yen/m^3

	HOKKAIDO (SAPPORO) AREA		TOHOKU (SENDAI) AREA		KANTO (TOKYO) AREA		TOKAI (SHIMIZU) AREA	
	Prev.Mo.	This Mo.	Prev.Mo.	This Mo.	Prev.Mo.	This Mo.	Prev.Mo.	This Mo.
2x4								
Hem-Fir (G)			55,000	55,000	62,000	62,000		
Hem-Fir (KD)					68,000	68,000	63,000	63,000
S-P-F (KD)	65,000	65,000			71,000	71,000	68,000	68,000
2x6								
Hem-Fir (G)			55,000	55,000	61,000	61,000		
Hem-Fir (KD)					68,000	68,000	62,000	62,000
S-P-F (KD)	65,000	65,000			71,000	71,000	69,000	69,000
2x8								
Hem-Fir (G)			55,000	55,000	61,000	61,000		
Hem-Fir (KD)					68,000	68,000	62,000	62,000
S-P-F (KD)	66,000	66,000			71,000	71,000	69,000	69,000
2x10								
Hem-Fir (G)			58,000	58,000	66,000	66,000		
Hem-Fir (KD)					74,000	74,000	69,000	69,000
S-P-F (KD)	69,000	69,000			76,000	76,000	73,000	73,000
2x12								
Hem-Fir (G)					71,000	71,000		
Hem-Fir (KD)					78,000	78,000		
S-P-F (KD)	72,000	73,000			85,000	85,000	75,000	75,000

TABLE #7 continued

2x4 MARKET PRICE MOVEMENT - CONTINUED.

		KANSAI (OSAKA) AREA		CHUGOKU (HIROSHIMA)		SKIKOKU (TAKAMATSU)		KYUSU (HAKATA)AREA	
		Prev.Mo.	This Mo.	Prev.Mo.	This Mo.	Prev.Mo.	This Mo.	Prev.Mo.	This Mo.
2x4									
Hem-Fir	(G)	55,000	55,000	57,000	57,000	60,000	60,000	53,000	53,000
Hem-Fir	(KD)	63,000	63,000	66,000	66,000	60,000	60,000		
S-P-F	(KD)	66,000	66,000	63,000	63,000	65,000	65,000	65,000	65,000
2x6									
Hem-Fir	(G)	54,000	54,000		56,000	60,000	60,000	53,000	53,000
Hem-Fir	(KD)	63,000	63,000			60,000	60,000		
S-P-F	(KD)	65,000	65,000	63,000	63,000	65,000	65,000	65,000	65,000
2x8									
Hem-Fir	(G)	55,000	55,000			60,000	60,000	53,000	53,000
Hem-Fir	(KD)	63,000	63,000			60,000	60,000		
S-P-F	(KD)	65,000	65,000	68,000	68,000	65,000	65,000	65,000	65,000
2x10									
Hem-Fir	(G)	60,000	60,000			65,000	65,000	56,000	56,000
Hem-Fir	(KD)	67,000	67,000	77,000	77,000	65,000	65,000		
S-P-F	(KD)	72,000	72,000	71,000	71,000	68,000	68,000	68,000	68,000
2x12									
Hem-Fir	(G)	64,000	64,000			65,000	65,000		
Hem-Fir	(KD)	70,000	70,000			65,000	65,000		
S-P-F	(KD)	75,000	74,000			68,000	68,000		

SOURCE: Jutaku Sangyo Shinbun September 18, 1985 issue.

3.0 JAPANESE APPROVAL REQUIREMENTS

This section outlines standards, processes and fees pertaining to acceptance of building materials and associated equipment.

3.1 JAPANESE LAWS AND REGULATIONS

The Japanese Building Standard Law, Article 38, Chapter II states:
"With respect to buildings using unexpected special materials or construction methods that are not contemplated in the provisions of this chapter and other relevant orders and ordinances, such provisions shall not apply when the Minister of Construction deems such materials or methods to be equal or superior to those contemplated hereunder".

A necessary step prior to authorization by the Minister of Construction is a technical appraisal by the Building Center of Japan (BCJ).

We were advised that a Certificate of Article 38 (Ministerial Approval) is the fastest and easiest route to have "unexpected" materials accepted. Certainly Jager's products, truss plates and Wood I Beams, fit the category of unexpected materials. It was indicated that a Certificate of Article 38 (or Ministerial Approval) is only granted to fairly solid Japanese companies which in fact accept the responsibility for the performance of these products.

The Japanese company would also have to operate a plant which is quality controlled by JAS certification. After a few years of successful use in Japan, it would then be possible to apply for an approval whereby the product would be dealt with as an expected material.

Depending on the product, it will cost your Japanese customer a fair amount of money to obtain the Certificate of Article 38 for your product. He probably has to want it pretty badly and probably needs to be pretty well connected politically in order to get it approved. Hence it becomes obvious why the Japanese are looking for long term relationships and why they want to be sure of your long term commitment as a business partner or supplier.

3.2 FEES AND TIME REQUIRED PERTAINING TO THE PROCESSES.

3.2.1 No one was able to estimate the fees pertaining to acceptance of truss plates and the like until particulars have been submitted to the Evaluation Committee by the JAS authorized plant.

3.2.2 Fees pertaining to the process of obtaining a Certificate of Article 38 for a truss operation may be more complex than some other products as it would include the truss connector, the truss designs as well as the fabricating equipment. It would require preparation and printing of a document of approximately 120 pages and distribution to local government offices throughout Japan. When we included the front end costs of government negotiation, Sanwa Home Inc. estimated that it would likely cost 7 to 10 million Yen and would take six to eight months.

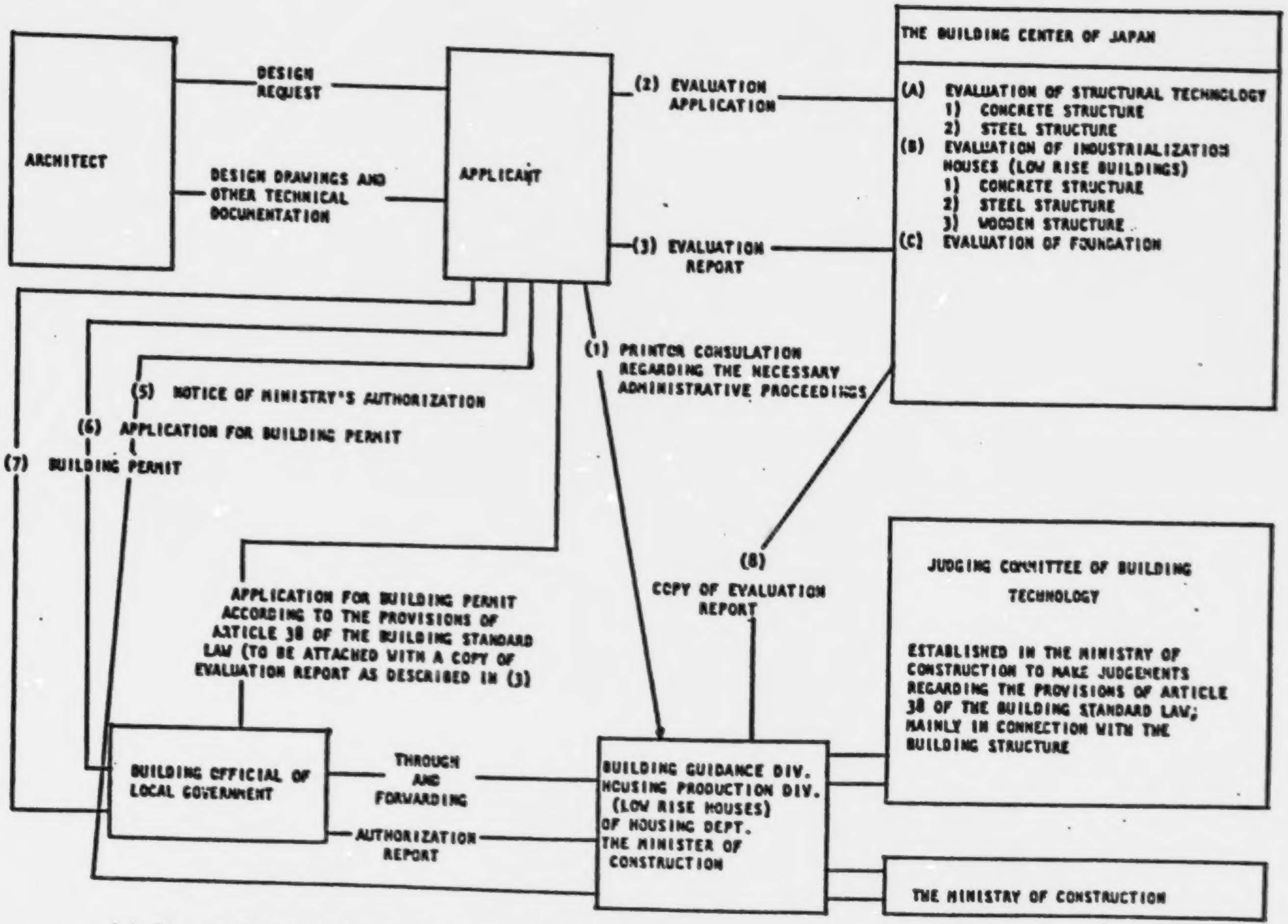
A flow chart of Evaluation, Authorization and Permit is shown as Figure #2.

FIGURE #2

FLOW CHART OF EVALUATION AUTHORIZATION

FLOW CHART OF EVALUATION AUTHORIZATION AND PERMIT

ACCORDING TO THE PROVISION OF ARTICLE 38 OF THE BUILDING STANDARD LAW


ARCHITECT
DESIGN REQUEST
DESIGN DRAWINGS AND OTHER TECHNICAL DOCUMENTATION
APPLICANT
(2) EVALUATION APPLICATION
(3) EVALUATION REPORT
THE BUILDING CENTER OF JAPAN
(A) EVALUATION OF STRUCTURAL TECHNOLOGY
1) CONCRETE STRUCTURE
2) STEEL STRUCTURE
(B) EVALUATION OF INDUSTRIALIZATION HOUSES (LOW RISE BUILDINGS)
1) CONCRETE STRUCTURE
2) STEEL STRUCTURE
3) WOODEN STRUCTURE
(C) EVALUATION OF FOUNDATION
(1) PRINTER CONSULATION REGARDING THE NECESSARY ADMINISTRATIVE PROCEEDINGS
(5) NOTICE OF MINISTRY'S AUTHORIZATION
(6) APPLICATION FOR BUILDING PERMIT
(7) BUILDING PERMIT
(8) COPY OF EVALUATION REPORT
APPLICATION FOR BUILDING PERMIT ACCORDING TO THE PROVISIONS OF ARTICLE 38 OF THE BUILDING STANDARD LAW (TO BE ATTACHED WITH A COPY OF EVALUATION REPORT AS DESCRIBED IN (3)
JUDGING COMMITTEE OF BUILDING TECHNOLOGY
ESTABLISHED IN THE MINISTRY OF CONSTRUCTION TO MAKE JUDGEMENTS REGARDING THE PROVISIONS OF ARTICLE 38 OF THE BUILDING STANDARD LAW; MAINLY IN CONNECTION WITH THE BUILDING STRUCTURE
BUILDING OFFICIAL OF LOCAL GOVERNMENT
THROUGH AND FORWARDING
AUTHORIZATION REPORT
BUILDING GUIDANCE DIV. HOUSING PRODUCTION DIV. (LOW RISE HOUSES) OF HOUSING DEPT. THE MINISTER OF CONSTRUCTION
THE MINISTRY OF CONSTRUCTION

* Applicant shall attach the notice of Ministry's authorization and the request documents for a building permit.

3.3 GOVERNMENT OFFICER, FIRMS AND TEST LABS INVOLVED IN THE PROCESS.

3.3.1 "Outline of the Technical Appraisal System" compiled by Japanese International Cooperation Agency and issued by The Building Center of Japan (B.C.J.), enclosed as Appendix "B" in this report, gives a broad idea of Japanese Building Standard Law as well as Technical Appraisal and Evaluation Systems.

There are 18 evaluation committees within the B.C.J. as shown on Table #8. The Committees No. 2 Structural Technology (no more than 60 meters in height), No. 3 "Building Foundations" and No. 12 "Industrialized Houses", will likely be involved in the approval process respecting all unexpected materials and methods including connector plates, wood I-beams, hangers and other accessories and O.S.B.

Committee No. 12, Industrialized Houses, headed by the Chairman, Professor H. Uchida, of the University of Tokyo, is responsible for evaluation of most of the wooden products through his five (5) sub-committees.

The five (5) sub-committees under Committee No. 12 are:

a. Environmental Performance: headed by the Chief Investigator, Mr. K. Eguchi of Construction Research Laboratory.

b. Durability Performance:
   Chief Investigator, Professor K. Imaizumi, Kogaku-In University.
c. Structural Steel Systems:
   Chief Investigator, Professor H. Hakura, Chiba Industrial University.
d. Structural Concrete Systems:
   Chief Investigator, Professor Y. Sonobe, Tsukuba University.
e. Structural Wood Systems:
   Chief Investigator, Professor H. Sugiyama, Tokyo University.

TABLE #8

EVALUATION COMMITTEES[1]

1. Technology for high rise buildings (More than 60 meters in height)
2. Structural technology (No more than 60 meters in height)
3. Building foundations
4. Computer programming: small capacity
   large capacity
5. Silos
6. Blast furnace slag as aggregates for concrete
7. Artificial light weight aggregates
8. Sheets for safety during construction
9. Septic tanks
10. Elevators and play facilities
11. F.R.P.
12. Industrialized houses
13. Durability
14. Fire resistance performance
15. Disaster prevention measures and facilities
16. Acoustic insulation structure
17. Fire resistant building process
18. Fire precaution and prevention plan

---

[1] Source: B.C.J.

3.3.2 JAS STRUCTURAL PLYWOOD

There is a strict test applied to any structural use of plywood and O.S.B. must meet this test. The requirements and test method are found in Appendix "C" and "D" as "JAS Structural Plywood", March 1983, issued by the Minister of Forest and Fisheries.

We enclose JAS "Common Plywood and its Commentary" as Appendix "E" issued by The Japan Plywood Inspection Corporation and The Japan Plywood Manufacturers' Association for future reference because it contains all test labs and locations.

3.3.3 A list of important ministries and contacts:

MITI: Ministry of International Trade and
Industry, 1-3-1 Kasumigaseki,
Chuyoda-Ku, Tokyo
Tsugio Ide, Director of Housing
Industry. Sumio Gotoh

MITI is reportedly very powerful, nothing of an international nature happens without their endorsement.

MOC: Ministry of Construction
2-1-3 Kasumigaseki
Chiyoda-Ku, Tokyo 100
581-0665

Kazuhiko Uragami, Director of Housing Production Division. Tomio Endo, his assistant gives approvals.

BCJ: Building Center of Japan
30 Mori Building
2-2, Toronomon, 3-chome
Minatu-Ku, Tokyo 105
434-7155

Toru Ogawara, General Manager, International Department.

4.0 CONCLUSION

The Japanese market for building materials, especially primary and secondary forest products, is large. The 2 x 4 sector of the market is growing rapidly with Japanese government blessing. Japanese sawmills and plywood plants are largely based on large diameter, high quality imported logs which are getting more difficult to import. The Japanese are under tremendous international pressure to open up their markets further but they are more likely to open them up to less manufactured products to which they can add value. They have a strong need for prefab and component technology. They recognize the need to improve the quality, durability and energy efficiency of their houses.

The apparent transportation disadvantages faced by Alberta producers have been largely overcome by the establishment of container ports in Calgary and Edmonton. This point must be sold to the Japanese importers who still view the Rocky Mountains as a formidable transportation obstacle. This must also be pointed out to Canadian lumber exporters, many of whom have offices and wholesale yards in Calgary or Edmonton. Some of these already export to Japan and the Pacific Rim from their B.C. offices and have not yet realized that Alberta suppliers could also supply part of the market competitively. Perhaps some of these wholesalers should consider installing container stuffing facilities in Calgary or Edmonton.

More work needs to be done in establishing Japanese grade requirements. We expect that many Japanese companies would accept an invitation to come to Alberta to work with the Alberta Forest Products Association and various interested sawmills to develop a better understanding of what they want and how we can meet their requirements. These quality requirements are high, but a clear understanding of their requirements would enable us to sort the lumber for maximum return while enjoying the benefits of a more diversified market.

Opportunities appear to exist in Japan for upgraded forest products, such as moulding stock made from fingerjointed pine or aspen, but these opportunities also exist in Alberta and are being largely ignored by the primary sector.

The approval process in Japan is complex and at times contradictory, much like the society itself, where the forces of tradition mix with ideas from the West. The business system as well as the approval process keep out the uncommitted and the impatient. On the other hand, patience and commitment, combined with a product that meets their needs, can result in business relationships which will endure short term adversities.

The Alberta Government has programs in place to assist Alberta companies who wish to export products to Japan or other countries. These programs are administered by the Economic Development and International Trade Department. The Alberta Government also maintains an office in Tokyo which can be of considerable assistance. Similar Federal Government programs and services are also available.

The Japanese have a great affinity for Alberta because we have so much of what they do not have - wide open spaces and the Rocky Mountains. Their small islands by contrast, are crowded with 120 million people and have almost no natural resources. Every year over 30,000

Japanese tourists visit Banff and Jasper and more would come if we had facilities to accommodate them. Returning to Japan after their holidays, they tell their friends and relatives what a wonderful place Alberta is. Perhaps we could find better ways to give these Japanese tourists commercial messages while they are here so when they return to Japan they can better describe Alberta as a market offering sound investment opportunities.

APPENDIX A:

JAPANESE AGRICULTURAL STANDARD (JAS) FOR STRUCTURAL LUMBER

APPENDIX A

JAS

Japanese Agricultural Standard For

STRUCTURAL LUMBER FOR WOOD FRAME CONSTRUCTION

SIS-4

March, 1983

JETRO

Only the Japanese-language texts on Japanese Agricultural Standards are official and authentic. This publication is a temporary translation prepared solely for the convenience of interested persons. In the event of any doubt arising, it is at all times advisable to refer to the original Japanese text.

The Japanese Agricultural and Forestry Standards for Structural Lumber for Wood Frame Construction

(Ministry of Agriculture, Forestry and Fisheries
Notification No. 600 of July 8, 1974)

1st amendment: No. 726 of June 9, 1978
2nd amendment: No. 406 of March 19, 1981
3rd amendment: No. 1914 of December 23, 1981

(Scope of Application)

Article 1 This standard shall apply to the structural lumber for wood frame construction.

(Definition)

Article 2. The terms given in the left column of the following table shall be as used herein as defined respectively in the right column:

Term	Definition
Structural lumber for wood frame construction	Coniferous lumber with dressed surfaces that are used as main structural members in wood frame construction.
A class framing lumber	Of the lumber for wood frame construction, those that are mainly used for members requiring high bending strength and stiffness.
B class framing lumber	Those lumber other than A class that are used for wood frame construction.

(Size code and Dimension)

Article 3 The size codes of structural lumber for wood frame construction herein prescribed shall be as given in the left column of the following table, which shall have the dimensions as specified respectively in the right columns:

(Unit: mm)

Size code	Dimension			
	Green lumber (moisture content more than 19%; hereafter the same)		Dry lumber (moisture content not more than 19%; hereafter the same)	
	Thickness	Width	Thickness	Width
203	40	65	38	64
204	40	90	38	89
206	40	143	38	140
208	40	190	38	184
210	40	241	38	235
212	40	292	38	286
404	90	90	89	89

(Standards for A Class Framing Lumber)

Article 4 The standards for A class framing lumber shall be as follows:

HOME CONSTRUCTION

Item				Standards			
				Special grade	1st grade	2nd grade	3rd grade
Quality	Knot or hole	In the lumber surface relating to the width	The maximum size of the knot or hole	The maximum size is not more than the values as given in Attached Table 1-(1), column for Special Grade.	The maximum size is not more than the values as given in Attached Table 1-(1), column for 1st Grade.	The maximum size is not more than the values as given in Attached Table 1-(1), column for 2nd Grade.	The maximum size is not more than the values as given in Attached Table 1-(1), column for 3rd Grade.
			Knots grouped	The sum of the size of all knots in any 15cm length of a piece is not more than twice the values as given in Attached Table 1-(1), column for Special Grade	The sum of the size of all knots in any 15cm length of a piece is not more than twice the values as given in Attached Table 1-(1), column for 1st Grade	The sum of the size of all knots in any 15cm length of a piece is not more than twice the values as given in Attached Table 1-(1), column for 2nd Grade	The sum of the size of all knots in any 15cm length of a piece is not more than twice the values as given in Attached Table 1-(1), column for 3rd Grade
			Number of holes	Not more than 1 in any 120cm length of a piece	Not more than 1 in any 90cm length of a piece	Not more than 1 in any 60cm length of a piece	Not more than 1 in any 30cm length of a piece
		In the lumber surface relating to the thickness		The maximum size of the knot measured by the equivalent displacement method at edge of the surface relating to width is not more than the values given in Attahced	The maximum size of the knot measured by the equivalent displacement method at edge of the surface relating to width is not more than the values given in Attached	The maximum size of the knot measured by the equivalent displacement method at edge of the surface relating to width is not more than the values given in Attached	The maximum size of the knot measured by the equivalent displacement method at edge of the surface relating to width is not more than the values given in Attached

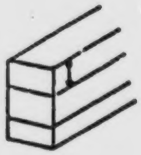
				Table 1-(1), column for Special Grade	Table 1-(1), colum for 1st Grade	Talbe 1-(1), column for 2nd Grade	Table 1-(1), column for 3rd Grade
Quality	Decay			None	Ditto	Slight	Not conspicuous
	Discoloration			1. No discoloration in the heartwood except the firm heartwood 2. The area of discoloration in the firm heartwood is not more than 10% of the lumber surface area of the piece.	No discoloration in the heartwood except the firm heartwood	Ditto	——
	Wane			1/4 the thickness, 1/4 the width. 5% of pieces may have wane up to 1/2 the thickness and 1/3 width for 1/4 the length.	Ditto	1/3 the thickness, 1/3 the width. 5% of pieces may have wane up to 2/3 the thickness and 1/2 width for 1/4 the length.	1/2 the thickness, 1/2 the width. 5% of pieces may have wane up to 7/8 the thickness and 3/4 the width for 1/4 the length.
	Fissures	Through Fissures	Fissures at ends	The length is not more than the width of the piece.	Ditto	The length is not more than 1.5 times the width of the piece.	The length is not more than 2 times the width of the piece.
			Fissures at other than ends	None	Ditto	The sum of lengths is not more than 60cm.	The sum of lengths is not more than 1/3 of the length of the piece.

Quality	Fissures	Other Fissures	Fissures at ends	The depth not more than 1/2 of the thickness of the piece.	Ditto	Ditto	——
			Fissures at other than ends	The sum of lengths is not more than 60cm.	Ditto	The sum of lengths is not more than 90cm. (or in case 1/4 of the length of the piece is more than 90cm, not more than 1/4 of the length of the piece)	——
	Other blemishes in processing			Not conspicuous	Ditto	No hindrance to practical use	Ditto
	Spring			Not more than 0.2%	Ditto	Not more than 0.5%	Ditto
	Bow, cup or twist			Slight		Not conspicuous	No hindrance to practical use
	Average width of growth rings (except radiata pine)			Not more than 6mm	Ditto	Ditto	——
	Central core (the part within 50mm radius from the centre of the		Size code: 203, 204, 206, 208 and 404	Shall not contain growth rings within 50mm radius from the centre of the pith	Ditto	Ditto	The pith length in the lumber surface relating to the thickness shall be not more than 1/4 of length of piece*

Quality	pith) or pith (applicable only to radiata pine)	Size code: 210 and 212	Within 1/3 of the width from the edges of the lumber surface relating to the width, these shall not contain growth rings whose curve radii exist within 50mm from the centre of the pith**	Ditto	Ditto	The length of pith contained in the surface bearing on thickness shall be not more than 1/4 of length of the piece

* i.e. the surface at which the thickness measurement is made.

** i.e. if the wide surface of the lumber is divided into thirds, the outer two thirds shall not contain growth rings whose curve radii fall within 50mm from the centre of the pith.



Slope of grain	Not more than 80mm	Not more than 100mm	Not more than 120mm	Not more than 250mm
Other defects	Slight	Ditto	Not conspicuous	No hindrance to practical use

Quality	Incising	Incising may not be regarded as blemishes; provided, however, that incising should not cause an about 10% or more decrease in the bending strength and Young's modulus of any lumber.
	Preservative/ termite-control treatment or preservative treatment	Those marked to the effect that preservative/ termite-control treatment or preservative treatment was given should have been duly treated with such a preparation made up in the mixture ratio of effective ingredients as specified in the Japanese Industrial Standard (hereinafter referred to as "JIS") K1550 Class 1 No. 1 (hereinafter referred to as "JIS K1550 Class 1 No. 1 preparation"), such a preparation made up in the mixture ratio of effective ingredients as specified in the JIS K1550 Class 1 No. 2 (hereinafter referred to as "JIS K1550 Class 1 No. 2 preparation"), such a preparation made up in the mixture ratio of effective ingredients as specified in the JIS K1554 No. 1 (hereinafter referred to as "JIS K1554 No. 1 preparation"), or such a preparation made up in the mixture ratio of effective ingredients as specified in the JIS K1554 No. 2 (hereinafter referred to as "JIS K1554 NO. 2 preparation").

<table>
<tr>
<td rowspan="3">Quality</td>
<td></td>
<td>In addition, those marked to the effect that preservative/termite-control treatment was given should stand testing either for preservative/termite-control treatment Class 1 or Class 2 provided for in Appendix and those marked to the effect that preservative treatment was given should successfully bear testing for preservative treatment Class 3 stipulated in the same.</td>
</tr>
<tr>
<td>Dimensions</td>
<td>1. The size code shall be 203, 204, 206, 208, 210,212 or 404.
2. A difference between the dimensions marked (size code) and those measured shall be not more than the values given in the following table:
(Unit: mm)
<table>
<tr><th></th><th>Difference between marked and measured dimensions</th></tr>
<tr><td>Thickness and width</td><td>±1.5</td></tr>
<tr><td>Length</td><td>+ no limited, -0</td></tr>
</table>
</td>
</tr>
<tr>
<td>Items for marking</td>
<td>1. The following should be marked in a block:
(1) Letters to indicate the species, or group of species
(2) Letters to indicate size code, and whether the lumber is green or dry
(3) Length
(4) Name or corporate name of the manufacturer or distributor (importer in case of imported products)
2. In case of the lumber marked to have been treated for preservation, the type of the preservative used should be given together with other items under 1. above.</td>
</tr>
</table>

Quality	Method of Marking	1. Items for marking given under 1. above from (1) through (3) should be marked as prescribed below: (1) Letters to indicate the species, group of species. For the species, the common name of the lumber, and for the species group, the symbols as shown in Attached Table 2, respectively, should be marked. (2) Letters to indicate the size code, and whether lumber is green or dry. The size code as shown in the table of Article 3, together with the letter "G" for green lumber and the letter "D" for dry lumber should be marked. (3) Length The length should be marked in millimeter, centimeter or meter, indicating clearly the unit used. 2. Those structural lumber which have been given preservative/termite-control treatment Class 1 should be marked with a "CLASS 1 PRESERVATIVE/TERMITE-CONTROL TREATED" or "PRESERVATIVE/TERMITE-CONTROL TREATMENT CLASS 1" sign, those which have been given preservative/termite-control treatment Class 2 with a "CLASS 2 PRESERVATIVE/TERMITE-CONTROL TREATED" or "PRESERVATIVE/TERMITE-CONTROL TREATMENT CLASS 2" sign, and those which have been given preservative treatment with a "CLASS 3 PRESERVATIVE TREATED" or "PRESERVATIVE TREATMENT CLASS 3" sign, along with the type of a preparation applied in accordance with the following procedure: (1) If the JIS K1550 Class 1 No. 1 preparation was applied, mark down its symbol "PF 1-1" or "P 1-1."

		3. Items for marking are shown clearly at a conspicuous place on each lumber.
	Prohibition against Marking	The following items are prohibited from marking: (1) Words that are contradictory to the contents of the marking made as prescribed above. (2) Other letters, pictures, etc. that are misleading as to the quality of the product.

(Standards for B Class Framing Lumber)

Article 5 The standards for the B class framing lumber shall be as follows:

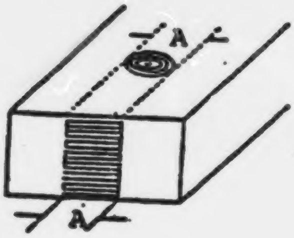
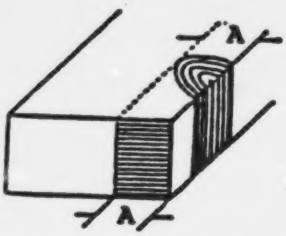
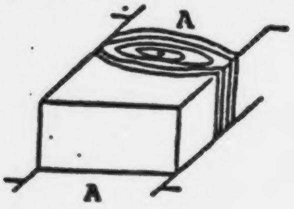
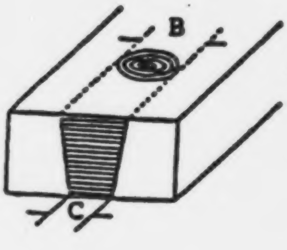
Item				Standards		
				Construction	Standard	Utility
Quality	Knot or hole	In the lumber surface relating to the width	The maximum size of the knot or hole	The maximum size is not more than the values as given in Attached Table 1-(2), column for Construction.	The maximum size is not more than the values as given in Attached Table 1-(2), column for Standards.	The maximum size is not more than the values as given in Attached Table 1-(2), column for Utility.
			Knots grouped	The sum of the size of all knots in any 15cm length of a piece is not more than twice the values as given in Attached Table 1-(2), column for Construction.	The sum of the size of all knots in any 15cm length of a piece is not more than twice the values as given in Attached Table 1-(2), column for Standards.	The sum of the size of all knots in any 15cm length of a piece is not more than twice the values as given in Attached Table 1-(2), column for Utility.
			Number of holes	Not more than 1 in any 90cm length of a piece	Not more than 1 in any 60cm length of a piece	Not more than 1 in any 30cm length of a piece
		In the lumber surface relating to the thickness		The maximum size of the knot measured by the equivalent displacement method at edge of the surface relating to width is not more than the values given in Attached	The maximum size of the knot measured by the equivalent displacement method at edge of the surface relating to width is not more than the values given in Attached	The maximum size of the knot measured by the equivalent displacement method at edge of the surface relating to width is not more than the values given in Attached

Quality			Table 1-(2), column for Construction. In case of the spike knot traversing the lumber surface relating to the width, however, the equivalent knot size ratio shall be not more than 1/4.	Table 1-(2), column for Standards. In case of the spike knot traversing the lumber surface relating to the width, however, the equivalent knot size ratio shall be not more than 1/3.	Table 1-(2), column for Utility. In case of the spike knot traversing the lumber surface relating to the width, however, the equivalent knot size ratio shall be not more than 1/2.
	Decay		None	Slight	Not conspicuous
	Discoloration		No discoloration in the heartwood except the hard core.	Ditto	——
	Wane		1/4 the thickness, 1/4 the width. 5% of pieces may have wane up to 1/2 the thickness and 1/3 the width for 1/4 the length.	1/3 the thickness 1/3 the width. 5% of pieces may have wane up to 2/3 the thickness and 1/2 the width for 1/4 the length.	1/2 the thickness, 1/2 the width. 5% of the pieces may have wane up to 7/8 the thickness and 3/4 the width for 1/4 the length.
Fissure	Through Fissure	Fissure at ends	The length is not more than the width of the piece.	The length is not more than 1.5 times the width of the piece.	The length is not more than 1/6 of the length of the piece.
		Fissure at other than ends	None	The sum of lengths is not more than 60cm.	The sum of lengths is not more than 1/3 of the length of the piece.
	Other Fissure	Fissure at end	The depth is not more than 1/2 of the thickness of the piece.	Ditto	——
		Fissure at other than ends	The sum of lengths should be not more 60cm.	The sum of lengths is not more than 90cm (or in case 1/4 of the length of the piece is more than 90cm, not more than 1/4 of the length of the piece.	——

Quality	Other blemishes in processing	Not conspicuous	No hindrance to practical use	Ditto
	Spring	Not more than 0.2%	Not more than 0.5%	Ditto
	Bow, cup or twist	Slight	Not conspicuous	No hindrance to practical use
	Pith (applicable only to radiata pine)	The length of pith contained in the surface relating to thickness shall be not more than 1/4 of the length of the piece.	Ditto	Ditto
	Slope of grain	Not more than 170 mm	Not more than 250 mm	Ditto
	Other defect	Slight	Not conspicuous	No hindrance to practical use
	Incising	Incising may not be regarded as blemishes; provided, however, that it should not cause an about 10% or more decrease in the bending strength and Young's modulus of any lumber.		
	Preservative/termite-control treatment or preservative treatment	Same as specified for the preservative treatment of A class framing lumbers.		
	Dimensions	1. The size code is 203, 204 or 404. 2. Same as specified for the dimensions of A class framing lumber under item 2.		
	Marking	Same as specified for the class A framing lumber.		

(Measuring Method)

Article 6 Measurement of the items as given in the left column of the following Table for the standards herein specified shall be made as given respectively in the right column of the the Table:

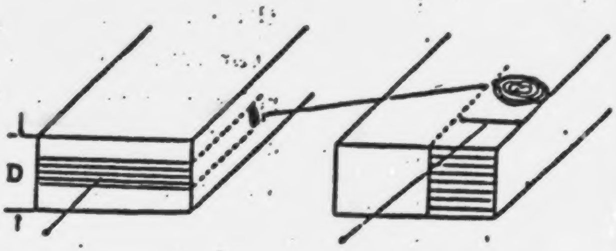
Item	Measuring method
Knot	1. **The size of a knot shall be a distance (A) between the two tangential lines parallel to arrises of a lumber surface in which the knot exists. (In cace a knot is divided by one or two arrises, however, the size of such a knot shall be the distance between, arris and the tangential line of the knot or the width of lumber surface in which the knot exists.) (Figs. 1 to 3). In case of a conic or conic trapezoid knot occurring in the lumber surface relating to the width, the size of knot shall be the average of the measured values in both surfaces involved $\left(\frac{B + C}{2}\right)$. (Fig. 4)** **Fig. 1**  **Fig. 2**  **Fig. 3**  **Fig. 4** 

2. The size of the knot in the surface relating to the thickness of the lumber shall be measured as follows:

(1) For the knot specified to be replaced by a knot at the edge of the surface relating to the width, the area (mm^2) of the knot as projected on the end divided by the thickness (mm) should be regarded as the size of the knot in the surface relating to the width. (Figs. 5 and 6)

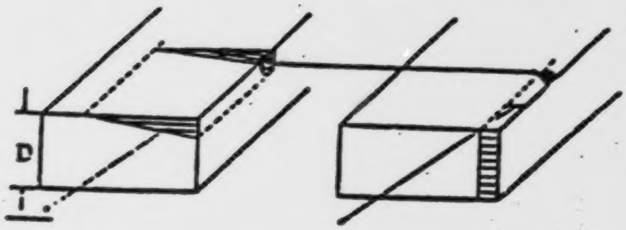
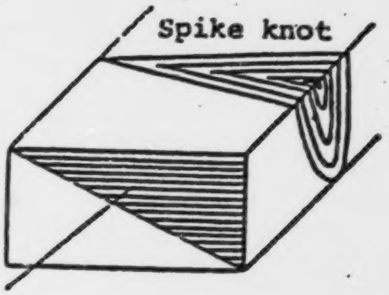
(2) For the knot specified to use the equivalent knot size ratio, the ratio of the knot area as projected on the end to the area of the end should be used. (Fig. 7)

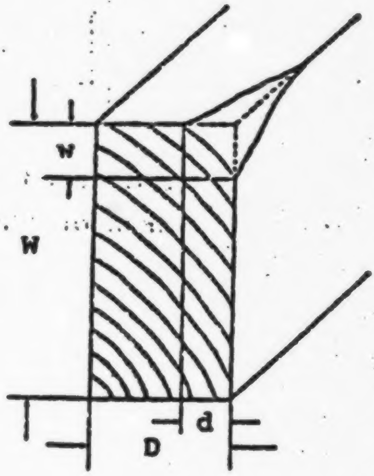
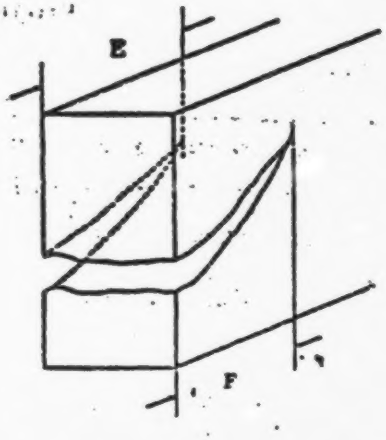
Fig. 5



Projected knot area on the end(s)

Size of the equivalent displacement at the edge of the surface relating to the width (S/D)

	Fig. 6  Projected knot area on the end(s) Size of the equivalent displacement knot at the edge of the surface relating to the width (S/D) Fig. 7  Projected knot area on the end
Hole	As to the size and the equivalent knot size ratio, those specified for knots should apply correspondingly.
Wane	1. The thickness wane should be the percentage of the wane thickness to the lumber thickness ($\frac{d}{D}$ x 100), while the width wane should be

	the percentage of the wane width to the lumber width $(\frac{w}{W} \times 100)$. (Fig. 8) Fig. 8  2. In case there are 2 or more wanes in the same surface, the sum should be used.
Through Fissure	1. The length of the through fissure at the end should be the average of the lengths from the ends of the 2 surfaces involved $(\frac{E + F}{2})$. (Fig. 9) Fig. 9 

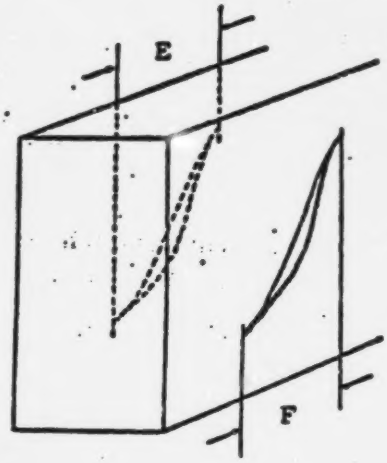
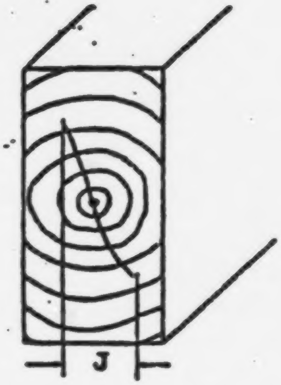
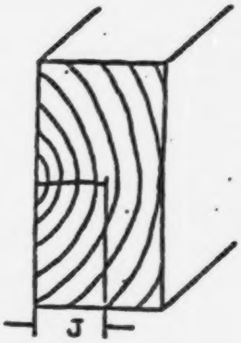
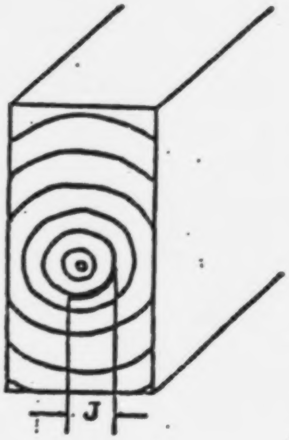
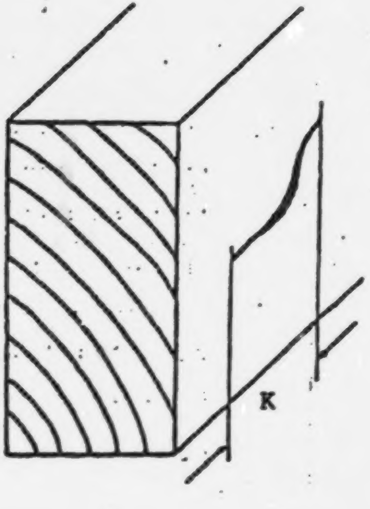
	2. The length of the through fissure at other than the end should be the average of the lengths in the 2 surfaces involved $(\frac{E + F}{2})$. (Fig. 10) Fig. 10  3. In case there are 2 or more through fissures in the same lumber surface, the longest fissure should be measured.
Other fissure	1. The depth of the other fissure at the end should be its depth (J) to the lumber surface relating to the thickness. (Figs. 11 to 13) Fig. 11  Fig. 12 

Fig. 13



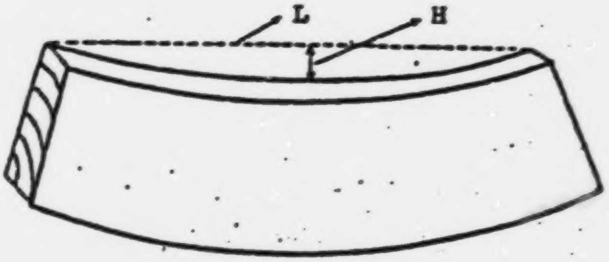
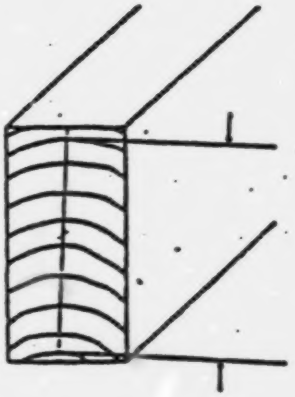
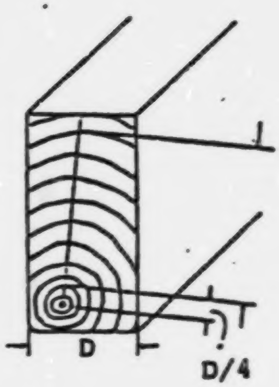
2. The length of the other fissure in the lumber surface other than the end should be its length (K) in the surface. (Fig. 14)

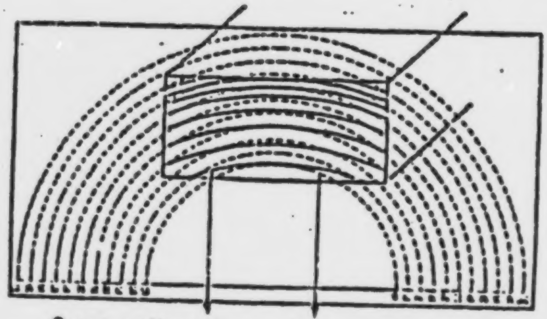
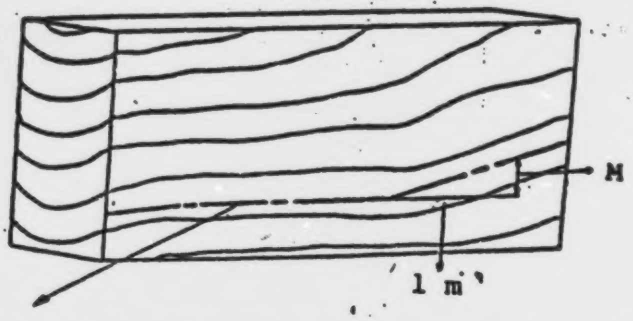
Fig. 14



3. In case there are 2 or more other fissures in the same lumber surface, the depth or length of the largest one should be measured.

4. For the depth and length of the other fissure of the dry lumber, 2/3 of the measured depth and length should be regarded as its depth and length.

Spring	The spring should be expressed as the percentage of the largest height of the concave curve to the length of the chord ($\frac{H}{L}$ x 100). (Fig. 15) Fig. 15 
Average annual ring width	The average width of the annual rings on the end should be the average of the widths of all complete annual rings on a straight line roughly radial to the rings. (Fig. 16). In case of a boxed heart wood, however, the measurement should be made excluding a part equivalent to 1/4 of the thickness of the lumber from the pith (Fig. 17) Fig. 16  Fig. 17 

Central core (the part within the 50mm radius from the centre of the pith) (applicable only to radiata pine)	The central core should be obtained through using the measuring instrument of transparent plastic-board (hereafter called measuring instrument) on which half circles (illustrated below) with curved radii from 50mm to 100mm at intervals of of 5mm are drawn. The measuring should be carried out by overlapping the half circle with curve radii of 50mm of the measuring instrument on the growth ring closest to the pith on the surface of the end. The judgement is obtained by comparing the curve radius of the growth ring existing between the curve radii from 50mm to 100 mm of the measuring instrument with the curve radius of the measuring instrument. (Fig. 18) Fig. 18  Curve radius of the growing ring Curve radius of the measuring instrument
Slope of grain	For the slope of the grain, the maximum height (M) of the slope of the grain over 1 meter lengthwise of the lumber should be measured. (Fig. 19) Fig. 19  Representative slope of grain

Supplementary Provisions:

Tests for Preservative/Termite-control treatment or Preservative Treatment

Tests for preservative/termite-control treatment or preservative treatment shall be conduced in accordance with the procedures described in Section 1 below. These tests, however, may be based on the procedures provided for in Section 2, if a species of preservative/termite-control treated or preservative-treated lumber and the penetration of a preservative applied are specified and the registered grading organization deems it possible to objectively determine the penetration of such a preservative against data obtained through penetration tests as prescribed in Section 1.4.1.

1. Procedures for testing specimens of wood taken by cutting

   1.1 Sampling

   Those preservative/termite-control treated or preservative-treated structural lumber for wood-frame construction from which test specimens are to be cut for testing purpose (hereinafter referred to as "treated sample lumber") shall be picked out at random from one lot of preservative/termite-control treated or preservative-treated structural lumber for wood-frame construction in such quantities as mentioned below in proportion to the number of such lumber making up a lot:

Number of lumber making up one lot	Number of treated sample lumber to be taken out *
1,000 or less	2
1,001 - 2,000	3
2,001 - 3,000	4
3,001 - 4,000	5

* For retesting purpose, treated sample lumber must be taken out in quantities twice as much as the number mentioned in the above table.

Note: If there is any lot consisting of more than 4,000 pieces of lumber, it should be divided into some smaller lots, each made up of 4,000 pieces and less.

1.2 Preparation of test specimens

To obtain test specimens, chips of proper length shall be cut away from the thicknesswise and widthwise sides of each treated sample lumber at its lengthwise central section.

1.3 Requirements for acceptance

If 90 percent or more of the test specimens are found to come up to the standards, then the lot made up of treated sample lumber from which such test specimens were obtained shall be regarded as accepted; if less than 70 percent, however, it shall be rejected. If this percentage for any lot comes within the range between 70 and 90 percent, meanwhile, another test specimens should be prepared from such a lot for retesting in compliance with the procedure specified in #1.2 above. If as a result of retesting 90 percent or more of the test specimens are found to have met the standards, the lot concerned shall be accepted, but if less than 90 percent, it shall be rejected.

1.4 Testing methods

1.4.1 Penetration tests

In determining the penetration of a preservative in structural lumber for wood-frame construction, color the preservative contained in each test specimen according to the testing procedure I, and apply data obtained to the formulas given below:

$$\text{Penetration in sapwood (\%)} = \frac{\text{Area of colored sapwood of a test specimen}}{\text{Area of sapwood of a test specimen}} \times 100$$

$$\text{Penetration in heartwood (\%)} = \frac{\text{Area of colored heartwood of a test specimen to a depth of 10mm from face}}{\text{Area of heartwood of a test specimen to a depth of 10mm from face}} \times 100$$

Testing Procedure I: Preservative Coloration Process

(1) For those structural lumber treated with the JIS K1550 Class 1 No. 1 or Class 1 No. 2 preservative: First, dissolve 2.5 grams of special-grade oxychlorinated zirconium (reagent) specified in JIS K8210 and 40 milliliters of special-grade hydrochloric acid (reagent) specified in JIS K8180 in water to prepare a one-liter solution. Then, make another one-liter solution by dissolving 2.5 grams of special-grade Alizarin Red S (sodium alizarine of sulfonic acid - reagent) specified in JIS K8057 in water. And, mix both solutions with each other in equal quantity to make an indicator. Apply this indicator to the penetrated section of a test specimen to see the extent to which it has changed to yellow in color.

(2) For those structural lumber treated with the JIS K1554 No. 1 or No. 2 preservative:
Prepare and indicator by dissolving 0.5 gram of special-grade diphenylcarbazide (reagent) specified in JIS K8488 and 50 milliliters of special-grade isopropyl alcohol (isopropanol - reagent)

specified in JIS K8839 in 50 milliliters of water. Apply the indicator to the section of a test specimen to see the extent to which it has changed to light reddish brown or purplish red in color.

1.4.2 Abrosption test

In determining the absorption of a preservative in structural lumber for wood-frame construction, measure the content of the preservative in each test specimen according to the testing procedure II and apply data obtained to the formula given below:

$$\text{Absorption } (\text{kg/m}^3) = \frac{\text{Content of the preservative (mg)}}{\text{Volume of all treated sample lumber per lot (cm}^3\text{)}}$$

Other process my be employed, however, if it is able to prove that a test specimen comes up to the standards.

Testing Procedure II: Quantitative Testing Process

(1) For those structural lumber treated with the JIS K1550 Class 1 No. 1 or Class 1 No. 2 Preservative: Take the following process of absorptiometric analysis to determine the content of chromium, arsenic, and fluorine compounds.

A. Preparation of a sample solution

a. For chromium and arsenic compounds -

Whittle down each test specimen at a depth of 10mm from its surface where a preservative has impregnated, crush it into fragments, and dry them up, so that about 0.5 gram of sample fragments of wood per test specimen can be obtained. Put all sample fragments for each lot into a 500-milliliter round-bottom flask with common trapballs and add a 10-milliliter solution of 30% special-grade hydrogen peroxide (reagent) specified in JIS K8230 and then 2 milliliters of special-grade sulfuric acid (reagent) specified in JIS K8951. Heat this flask slowly in a sand bath to resolve its contents. When the contents of the flask are condensed to about 2 milliliters, add once again a 5-milliliter solution of 30% special-grade hydrogen peroxide (reagent) specified in JIS K8230. Repeat this process until sample fragments have completely resolved themselves and turned to transparent green in color. Concentrate the contents into about 2 milliliters and allow them to cool for a time undisturbed. While washing its inner wall in water, pour the contents from the round-bottom flask into a 1,000-milliliter messflask up to the standard level to dilute the contents to the required consistency, so that a sample solution can be obtained.

b. For fluorine compound -

Whittle down each test specimen at a depth of 10mm from its surface where a preparation has impregnated, crush it into fragments, and dry them up, so that about 0.5 gram of sample fragments of wood per test specimen can be obtained. Put all sample fragments for each lot into a 250-milliliter Claisen flask and add 5 drops of a saturated solution of special-grade potassium permanganate (reagent) specified in JIS K8247, 30 milliliters of water, and 35 milliliters of special-grade sulfuric acid (reagent) specified in JIS K8951. Heat this Claisen flask and perform steam distillation while keeping the inner temperature at 135°C to produce 250 milliliters of distillate. Put this distillate into a 1,000-milliliter messflask and pour water up to the standard level to dilute it to the required consistency, so that a sample solution can be obtained.

B. Preparation of a reagent and a measuring line

The reagent and measuring line for a chromium compound shall be prepared in accordance with 51.1.1 of JIS K0102 (Industrial Effluent Testing Procedures); for an arsenic compound in accordance with 48.2 of JIS K0102 (Industrial Effluent Testing Procedures); and for a fluorine compound in accordance with 28.1 of JIS K0102 (Industrial Effluent Testing Procedures).

C. Method of determining the quantity of chromium, arsenic, and fluorine compounds

a. Chromium compound

Put less than 30 milliliters of a sample solution (containing 0.003 - 0.05 milligram of chromium) each into two beakers A and B. Pour water into the beaker A to increase its content into approximately 30 milliliters and add 0.5 milliliter of sulfuric acid (1 + 1). Stir them up and add several drops of potassium permanganate (0.3 w/v%) to turn the color of the sample solution into light red. Heat the beaker A until the color of the sample solution has died away. Then further add a few drops of a potassium permanganate (0.3 w/v%) solution. Repeat this process until the light red color stands even after heating the sample solution up to boiling for five minutes. Cool the sample solution and add a 10-milliliter urea solution (20 w/v%). Drop a sodium nitrite solution (10 w/v%) into the sample while giving it a violent stir to resolve excessive permanganic acid. Again cool the sample solution and, while washing its inner wall in water, pour it from the beaker into a 50-milliliter messflask and keep the temperature of the solution at 15°C. Shake the messflask immediately after adding a one-milliliter diphenylcarbazide solution (1 w/v%). Further add water up to the standard level, shake the messflask, and leave it for five minutes. Pour the solution from the messflask into a 10-mm absorption cell, so that the solution A can be obtained. Then, add 0.5 milliliter of sulfuric acid (1 + 1) to a sample solution in the beaker B. While washing its inner wall in water, pour the sample solution from the beaker B into a 50-milliliter messflask. Add a 1-milliliter disphenylcarbazide solution (1 w/v%) and water up to the standard level line, shake the messflask adequately, and pour the sample solution from the messflask into a 50-milliliter absorption cell, so that the solution B can be obtained. In comparison with the solution, B measure the absorbance of the solution A in the vicinity of 540 nm wavelength, determine the amount of chromium according to the measuring line prepared in advance, and obtain the quntity of a chromium compound ($K_2Cr_2O_7$) by solving the formula given below:

$$K_2Cr_2O_7 = Cr \times 2.829 \times \frac{1{,}000}{\text{volume of sample solution taken (ml)}}$$

Where,

$K_2Cr_2O_7$: amount of a chromium compound (mg)

Cr: amount of chromium determined on the basis of the measuring line (mg)

b. Arsenic compound

Determine the amount of arsenic in a sample solution in compliance with the rovisions of 48.2 of JIS K0102 (Industrial Effluent Testing Procedures), and then obtain the amount of an arsenic compound (Na_2HAsO_4) by solving the formula given below:

$$Na_2HAsO_4 = As \times 2.481 \times \frac{1{,}000}{\text{volume of sample solution taken (ml)}}$$

Where,

Na_2HAsO_4 : amount of an arsenic compound (mg)

As : amount of arsenic determined on the basis of the measuring line (mg)

c. Fluorine compound

Put less than 30 milliliters of a sample solution (containing 0.003 - 0.05 mg of fluorine) into a 50-milliliter messflask. Add a 20-milliliter lanthanum-alizarincomplexon solution and water up to the standard level line, shake the messflask and leave it for about an hour. Then, pour some of this solution from the messflask into a 10-mm absorption cell. While comparing it with a test solution [1/], measure the absorbance of the sample solution in the vicinity of 620 nm wavelength, determine the amount of fluorine according to the measuring line prepared in advance, and obtain the quantity of a fluorine compound (NaF) by solving the formula given below:

$$NaF = F \times 2.210 \times \frac{1{,}000}{\text{volume of sample solution taken (ml)}}$$

Where,

NaF : amount of a fluorine compound (mg)

F : amount of fluorine determined on the basis of the measuring line (mg)

[1/] A test solution is obtained through the same process as described in A. b. and C. c. without using any sample.

D. Method of determing the content of a preservative in structural lumber

The content of a preservative in structural lumber can be determined by applying the value obtained in C to the formula given below:

$$\text{Content of preservative (mg)} = P \times \frac{1}{\epsilon}$$

Where,

P : amount of chromium, arsenic, or fluorine compound

ϵ : a coefficient to convert the amount of each ingredient measured into the content of a preservative. The coefficient for each ingredient shall be as shown in the table below:

Compound	JIS K1550 preservative	
	Class 1 No. 1	Class 1 No. 2
chromium	0.39	0.22
arsenic	0.22	0.11
fluorine	0.28	0.56

(2) For those structural lumber treated with the JIS K1554 No. 1 or No. 2 preservative:

Take the following process of absorptiometric or atomic absorptiometric analysis to determine the content of chromium, copper, and arsenic compounds.

(2)-1 Absorptiometric Process

A. Preparation of a sample solution
Same as (1).A.a.

B. Preparation of a reagent and a measuring line

The reagent and measuring line for a chromium compound shall be prepared in accordance with 51.1 of JIS K0102 (Industrial Effluent Testing Procedures); for a copper compound in accordance with 37.1 of JIS K0102 (Industrial Effluent Testing Procedures); and for an arsenic compound in accorance with 48.2 of JIS K0102 (Industrial Effluent Testing Procedures)

C. Method of determining the quantity of chromium, copper and arsenic compounds

a. Chromium compound

Determine the amount of chromium in a sample solution following the process described in (1).A.a., and obtain the quantity of a chromium compound ($K_2Cr_2O_7$ if treated with the JIS K1554 No. 1 preservative, or CrO_3 if treated with the JIS K1554 No. 2 preservative) by solving either one of the formulas given below:

$$K_2Cr_2O_7 = Cr \times 2.829 \times \frac{1{,}000}{\text{amount of sample solution taken (ml)}}$$

$$CrO_3 = Cr \times 1.923 \times \frac{1{,}000}{\text{amount of sample solution taken (ml)}}$$

Where,

$K_2Cr_2O_7$: amount of a chromium compound in those lumber treated with the JIS K1554 No. 1 preservative (mg)

CrO_3 : amount of a chromium compound in those lumber treated with the JIS K1554 No. 2 preservative (mg)

Cr : amount of chromium determined according to the measuring line (mg)

b. Copper compound

Determine the amount of copper in a sample solution in accordance with the provisions of 37.1 of JIS K0102 (Industrial Effluent Testing Procedures), and obtain the quantity of a copper compound ($CuSO_4 \cdot 5H_2O$ if treated with the JIS K1554 No. 1 preservative, or CuO if treated with the JIS K1554 No. 2 preservative) by solving either one of the formulas given below:

$$CuSO_4 \cdot 5H_2O = Cu \times 3.929 \times \frac{1{,}000}{\text{amound of sample solution taken (ml)}}$$

$$CuO = Cu \times 1.252 \times \frac{1{,}000}{\text{amount of sample solution taken (ml)}}$$

Where,

$CuSO_4 \cdot 5H_2O$: amount of a copper compound in those lumber treated with the JIS K1554 No. 1 preservative (mg)

CuO : amount of a copper compound in those lumber treated with the JIS K1554 No. 2 preservative (mg)

Cu : amount of copper determined according to the measuring line (mg)

c. Arsenic compound

Determine the amount of arsenic in a sample solution in accordance with the provisions of 48.2 of JIS K0102 (Industrial Effluent Testing Procedures), and obtain the quantity of an arsenic compound ($As_2O_5 \cdot 2H_2O$ if treated with the JIS K1554 No. 1 preservative, or H_3AsO_4 if treated with the JIS K1554 No. 2 preservative) by solving either one of the following formulas:

water, pour the contents from the round-bottom flask into a 250-milliliter messflask, and add a 25-milliliter sodium sulfate solution (3 w/v%). Then, pour water into this messflask up to the standard level line to dilute the contents to the required consistency, so that a sample solution can be obtained.

B. Preparation of a standard undiluted sample solution and a standard sample solution for the development of a measuring line

a. Standard undiluted sample solution

Precisely 0.983 gram of special-grade copper sulfate II pentahydrate (reagent) specified in JIS K8983, 1.415 grams of special-grade potassium bichromate (reagent) specified in JIS K8517, and 0.660 gram of arsenic trioxide or white arsenic (reagent) specified in JIS K8044 are measured into a 300-milliliter beaker. Add 25 milliliters of water, a 10-milliliter solution of 30% special-grade hydrogen peroxide (reagent) specified in JIS K8230, and 4 milliliters of special-grade sulfuric acid (reagent) specified in JIS K8951. Heat the beaker slowly in a sand bath to resolve its contents. While washing its inner wall in water, pour the contents from the beaker into a 500-milliliter messflask, and add a 50-milliliter sodium sulfate solution (3 w/v%) and water, so that a 500-milliliter standard undiluted sample solution can be obtained.

Note: If the commercial standard solution for atomic absorptiometric analysis is used, a standard undiluted sample solution should be prepared in such a way as to enture that the concentration of sulfuric acid and sodium sulfate are 0.288N and 0.3% respectively by mixing chromium, copper, and arsenic together in the ratio of 2 : 1 : 2, and adding a 30% solution of special-grade hydrogen peroxide (reagent) specified in JIS K8230 to deoxidize chromium.

ϵ : a coefficient to convert the amount of each ingredient measured into the content of a preservative. The coefficient for each ingredient shall be as given in the table below:

Compound	JIS K1554 preservative	
	No. 1	No. 2
chromium	0.56	0.27
copper	0.33	0.15
arsenic	0.11	0.42

(2)-2. Atomic Absorptiometric Process

A. Preparation of a sample solution

Whittle down each test specimen at a depth of 10mm from its surface where a preparation has penetrated, crush it into fragments, and dry them up, so that about 0.5 gram of sample fragments of wood can be obtained from each test specimen. Put all sample fragments for each lot in a 500-milliliter round-bottom flask with common trapballs and add a 10-milliliter solution of 30% special-grade hydrogen peroxide (reagent) specified in JIS K8230 and then 2 milliliters of special-grade sulfuric acid (reagent) specified in JIS K8951. Heat this flask slowly in a sand bath to resolve its contents. When the contents of the flask are condensed to about 2 milliliters, add once again a 5-milliliter solution of 30% special-grade hydrogen peroxide (reagent) specified in JIS K8230. Repeat this process until sample fragments have completely resolved themselves and turned to transparent green in color.

Concentrate the contents into about 2 milliliters and allow them cool for a time undisturbed. While washing its inner wall in

$$As_2O_5.2H_2O = As \times 1.774 \times \frac{1,000}{\text{amount of sample solution taken (ml)}}$$

$$H_3AsO_4 = As \times 1.895 \times \frac{1,000}{\text{amount of sample solution taken (ml)}}$$

Where,

$As_2O_5.2H_2O$: amount of an arsenic compound in those lumber treated with the JIS K1554 No. 1 preservative (mg).

H_3AsO_4 : amount of an arsenic compound in those treated with the JIS K1554 No. 2 preservative (mg)

As : amount of arsenic determined according to the measuring line (mg)

D. Method of determinig the content of a preservative in structural lumber

The content of a preparation in structural lumber can be determined by applying the value obtained in C to the formula given below:

$$\text{Content of preservative (mg)} = P \times \frac{1}{\epsilon}$$

Where,

P : amount of chromium, copper, or arsenic compound (mg)

b. Preparation of standard sample solution

Put precisely 10 milliliters of the standard undiluted sample solution into a 100-milliliter messflask and dilute it with a sulfuric acid and sodium sulfate solution up to the standard level line. From this messflask 0 - 15 milliliters of the mixed solution are measured into other 100-milliliter messflasks and diluted with a sulfuric acid and sodium sulfate solution up to the standard level line, so that the standard sample solutions can be obtained.

Note: To prepare a sulfuric acid and sodium sulfate solution,

Add 8 milliliters of special-grade sulfuric acid (reagent) specified in JIS K8951 to 500 milliliters of water and give it a stir. In it dissolve 3 grams of special-grade anhydrous sodium sulfate (reagent) specified in JIS K8987 and dilute it with water to prepare a 1,000-milliliter solution.

C. Method of determining the concentration of chromium, copper and arsenic

First, determine the absorbance of chromium, copper, and arsenic in the standard sample solution using an atomic absorptiometer. Plot data so obtained on a graph by indicating the concentration of chromium, copper, and arsenic in the standard sample solution on the horizontal axis and their respective absorbance on the vertical axis, so that a measuring line can be developed. Then, determine the absorbance of each ingredient of a sample solution using an atomic absorptiometer as well. And obtain the concentration of each ingredient from a rectilinear region of the measuring line. A combustion flame and the wave length of an analytical line for each ingredient shall be as shown below:

ingredient	combustion flame	wavelength (nm)
chromium	air-acetylene	357.9 or 429.0
copper	air-acetylene	324.8
arsenic	argon-hydrogen	193.7 or 197.0

If the absorbance of a sample solution does not come within the range of the measuring line, dilute it with a sulfuric acid and sodium sulfate solution to the required consistency to allow its absorbance to come within that range before measurement.

Notes: 1. Do not extend the measuring line to reckon the consistency of a sample solution if its absorbance exceeds the maximum concentration level on the measuring line.

2. For chromium and arsenic, any wavelength shown in the above table can be used, but the same wavelength must consistently be employed for analysis.

D. Method of determining the content of a preservative

The content of a preservative can be determined by applying the value obtained in C. to the formula given below:

$$\text{Content of preservative (mg)} = P \times \frac{250 \times \text{dilution factor of sample solution}}{1{,}000} \times f \times \frac{1}{\epsilon}$$

Where,

P : concentration of chromium, copper, or arsenic obtained from the measuring line (mg/liter)

f : a coefficient to turn the value obtained for chromium, copper, or arsenic into that for each compound. The coefficient for each compound shall be as shown in the table below depending on the type of a preservative applied for preservative/termite-control treatment or preservative treatment:

type of preservative	chromium compound	copper compound	arsenic compound
JIS K1554 No. 1	2.829	3.929	1.774
JIS K1554 No. 2	1.923	1.252	1.895

ϵ: a coefficient to convert the value obtained for each ingredient into the content of a preservative. The coefficient for each ingredient shall be as indicated in the table below:

ingredient	JIS K1554	
	No. 1	No. 2
chromium compound	0.56	0.27
copper compound	0.33	0.15
arsenic compound	0.11	0.42

Note: To find the volume of all the treated sample lumber taken from one lot,

Obtain the oven dry specific gravity of a bit of wood whittled away from the same test specimen as used to prepare a sample solution for the measurement of the content of a preservative, and divide the amount or oven dry weight of sample lumber taken out by the oven dry specific gravity obtained.

Volume of each sample lumber (cm^3)

$$= \frac{\text{Amount or oven dry weight of lumber (g)}}{\text{oven dry specific gravity}}$$

Then, add up the values obtained to figure out a total for each lot.

1.5 Requirements for acceptance of test specimens

1.5.1 Preservative/termite-control treatment Class 1

Any test specimen should have duly been given presrvative/termite-control treatment with the JIS K1554 No. 1 or No. 2 preservative and come up to the standards in penetration and absorption tests as specified below.

A. Penetration tests

The penetration of any test specimen must be above the standard level indicated below depending on whether its section is of sapwood or heartwood or both:

Section of test specimen	Standard level of penetration
sapwood	80%
heartwood	80%
sapwood and heartwood	80%

B. Absorption tests

The absorption of any test specimen must be above the standard level indicated below depending on the type of a preservative applied:

type of preservative	standard level of absorption (kg/cm^3)
JIS K1554 No. 1	10.0
JIS K1554 No. 2	7.5

1.5.2 Preservativc/termite-control treatment Class 2

Any test specimen should have duly been given presrvative/termite-control treatment with the JIS K1550 Class 1 No. 1 or Class 1 No. 2 or JIS K1554 No. 1 or No. 2 preservative and come up to the standards in penetration and absorption tests as specified below.

A. Penetration tests

Same as 1.5.1, A.

B. Absorption tests

The absorption of any test specimen must be above the standard level indicated below depending on the type of a preservative applied:

type of preservative	standard level of absorption (kg/cm^3)
JIS K1550 Class 1 No. 1 or Class 1 No. 2	6.0
JIS K1554 No. 1	6.0
JIS K1554 No. 2	4.5

1.5.3 Preservative treatment Class 3

Any test specimen should have been duly given preservative treatment with the JIS K1550 Class 1 No. 1 or Class 1 No. 2 or JIS K1554 No. 1 or No. 2 preservative and come up to the standards in penetration and absorption tests as specified below. These standards, however, apply to larch and Douglas fir lumber only.

A. Penetration tests

The penetration of any test specimen must be above the standard level indicated below depending on whether its section is of sapwood or heartwood or both:

Section of test specimen	Standard level of penetration
sapwood	80%
heartwood	20%
sapwood and heartwood mixed	80% for sapwood 20% for heartwood

B. Absorption tests

Same as 1.5.2,, B.

2. Procedures for testing specimens of wood taken by an increment borer

2.1 Sampling

Those treated sample lumber shall be picked out at random from one lot of preservative/termite-control treated or preservative treated structural lumber for wood-frame construction in such quantities as mentioned below in proportion to the number of such lumber making up a lot:

Number of lumber making up one lot	Number of treated sample lumber to be taken out *
1,000 or less	8
1,001 - 2,000	12
2,001 - 3,000	16
3,001 - 4,000	20

* For retesting purpose, treated sample lumber must be taken out in quantities twice as much as the number mentioned in the above table.

Note: If there is any lot consisting of more than 4,000 pieces of lumber, it should be divided into some smaller lots, each made up of 4,000 pieces and less.

2.2 Preparation of test specimens

Take out a test specimen from the widthwise and lengthwise central section of each treated sample lumber where there exists the lest incising or crack or other defect, using an increment borer with the internal diameter of 4.5mm ± 0.03mm at right angles to the surface of the lumber. The length of each test specimen to be taken out should be as indicated below depending on the presence of heartwood:

Treated sample lumber	Length of test specimens to be taken out
Heartwood exists within 10mm from its surface	10mm from the surface of lumber
Heartwood exists at a depth of more than 10mm from its surface	From the surface of lumber to heartwood
No heartwood exists	A half the thickness of lumber lumber from its surface

2.3 Requirements for acceptance

Same as 1.3.

2.4 Testing methods

2.4.1 Penetration tests

In determining the penetration of a preservative in structural lumber, color the preservative contained in each test specimen according to the testing procedure I, and apply data obtained to the formulas given below:

$$\text{Penetration in sapwood (\%)} = \frac{\text{Length of colored sapwood of each test specimen (mm)}}{\text{Length of sapwood of each test specimen (mm)}} \times 100$$

$$\text{Penetration in heartwood (\%)} = \frac{\text{Length of colored heartwood of a test specimen (mm)}}{\text{Length of heartwood of a test specimen (mm)}} \times 100$$

Testing Procedure I: Preservative Coloration Process

Same as Testing Procedure I in 1.4.1.

2.4.2 Absorption tests

In determining the absorption of a preservative in structural lumber, measure the content of a preservative contained in each test specimen according to the testing procedure II and apply data obtained to the formula given below:

$$\text{Absorption (kg/cm}^3\text{)} = \frac{\text{Content of a preservative (mg)}}{\text{Volume of all treated sample lumber per lot (cm}^3\text{)}}$$

Other process may be employed, however, if it is able to prove that each test specimen comes up to the standards.

Testing Procedure II: Quantitative Testing Process

(1) For those structural lumber treated with the JIS K1550 Class I No. 1 or Class 1 No. 2 preservative:

Take the following process of absorptiometric analysis to determine the content of chromium, arsenic, and fluorine compounds.

A. Preparation of a sample solution

a. For chromium and arsenic compounds -

Cut a chip out of each test specimen used in penetration tests at a depth of 10mm from its surface where a preservative has penetrated and measure its length, so that a sample can be obtained. Put all samples for each lot into a 500-milliliter round-bottom flask with common trapballs. Prepare a sample solution by going through the same process as described in (1), A, a of the testing procedure II in 1.4.2.

b. For fluorine compound -

Provide test specimens for quantifying fluorine in the same quantity as used in impregnation tests.

Cut a chip out of each test specimen at a depth of 10mm from its surface where a preparation has impregnated and measure its length, so that a sample can be obtained. Put all samples for each lot into a 250-milliliter Claisen flask. Prepare a sample solution by going through the same process as described in (1), A, b of the testing procedure II in 1.4.2.

B. Preparation of a reagent and a measuring line

Same as (1), B of the testing procedure II in 1.4.2.

C. Method of determining the quantity of chromium, arsenic, and fluorine compounds

Same as (1), C of the testing procedure II in 1.4.2.

D. Method of determining the content of a preparation in structural lumber

Same as (1), D of the testing procedure II in 1.4.2.

(2) For those structural lumber treated with the the JIS K1554 No. 1 or No 2 preparation:

Take the following process of absorptiometric or atomic absorptiometric analysis to determine the content of chromiun, copper, and arsenic compounds.

(2)-1 Absorptiometric Process

A. Preparation of a sample solution

Same as (1). A. a.

B. Preparation of a reagent and a measuring line

Same as (2)-1. B of the testing procedure II in 1.4.2.

C. Method of determining the quantity of chromium, copper and arsenic compounds

Same as (2)-1. C. of the testing procedure II in 1.4.2.

D. Method of determining the content of a preparation in structural lumber

Same as (2)-1. D. of the testing procedure II in 1.4.2.

(2)-2 Atomic Absorptiometric Process

A. Preparation of a sample solution

Cut a chip out of each test specimen used in impregnation tests at a depth of 10mm from its surface where a preparation has impregnated and measure its length, so that a sample can be obtained. Put all samples for each lot into a 50--milliliter round-bottom flask with common trapballs. Prepare a sample solution by going through the same process as described in (2)-2. A of the testing procedure II in 1.4.2.

B. Preparation of a standard undiluted sample solution and a standard sample solution to develop a measuring line

Same as (2)-2. B of the testing procedure II in 1.4.2.

C. Method of determining the concentration of chromium, copper and arsenic

Same as (2)-2. C of the testing procedure II in 1.4.2.

D. Method of determining tho contest of a preparation

Same as (2)-2. D of the testing procedure II in 1.4.2

Note: To obtain the volume of all sample for each lot,

Volume of all samples for each lot (cm3)

= 0.0159 x the total length of samples (mm)

2.5 Requirements for acceptance of test specimens

Same as 1.5.

Attached Table 1

(1) Class A Framing Lumber

(Unit: mm)

Grade / Size code	Special grade			First grade			Second grade			Third grade		
	Sound knots		Holes (incl. decay and loose knots)	Sound knots		Holes (incl. decay and loose knots)	Knots		Holes	Knots		Holes
	At edge	At center		At edge	At center		At edge	At center		At edge	At center	
203	13	13	13	19	19	19	22	22	22	32	32	32
204	19	22	19	25	38	25	32	51	32	44	64	44
206	29	48	25	38	57	32	48	73	38	70	95	51
208	38	57	32	51	70	38	64	89	51	89	114	64
210	48	67	32	64	83	38	83	108	64	114	140	76
212	57	76	32	76	95	38	95	121	76	140	165	89
404	22	22	19	38	38	25	51	51	32	64	64	44

(2) Class B Framing Lumber

(Unit: mm)

Grade / Size code	Construction		Standard		Utility	
	Sound knots loose	Holes (incl. decay and knots)	Knots	Holes	Knots	Holes
203	32	19	38	25	51	32
204	38	25	51	32	64	38
404	38	25	51	32	64	38

Attached Table 2

Symbol for species type	Symbol for species group	Speceis
S I	D Fir-L	Douglas fir, Western larch, Japanese black pine, Japanese red pine, Dahurica larch and others of this group
	Hem-Tam	Pacific Coast yellow-cedar, Tamarack, Jack pine, Eastern hemlock, Japanese larch, False arborvitae, Japanese cypress, Chamaecypris taiwanensis and others of this group
S II	Hem-Fir	Pacific Coast hemlock, Amabilis fir, grand fir, Southern Japanese hemlock and others of this group
	S-P-F or Spruce-Pine-Fir	Balsam fir, Lodgepole pine, Ponderosa pine, white spruce, Engelmann spruce, black spruce, red spruce, Coast Sitka spruce, Alpine fir, Momi fir, Yezo spruce, white fir, Scotch pine, Merck pine, Radiata pine and others of this group
	W Cedar	Western red cedar, red pine, Western white pine, Japanese cedar, Agathis, red pine and others of this group

Date of Enforcement:

This Notification shall be effective January 23, 1982

JAPAN EXTERNAL TRADE ORGANIZATION
Standards Information Sesvice

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APPENDIX B

Text for The Group Training Course of Building Engineering

OUTLINE OF THE TECHNICAL APPRAISAL SYSTEM

Japan International Cooperation Agency

CONTENTS

Page

I. Introduction to the Building Regulations in Japan 1

1. General Structure of the Legal System in Japan 1

2. Building Standards Law 1

1) Its unique characteristics 1
2) Construction of the law 2
3) General provisions 3
4) Building code sector 3
5) Supplementary orders 3

3. Other Laws and Orders Relating to Building Regulations 4

II. Technical Appraisal System of BCJ 5

1. Legal Basis 5

2. Role of BCJ 5

3. Proceedings for Initiating the Technical Appraisal System 6

attached:

Table 1 – Evaluation Committees 9

Table 2, 3, 4 – Flow Charts of Proceedings 10

Table 5 – List of Technologies Evaluated by BCJ (1978 – '82) 13

5-1 – High Rise Bldg. 14
5-2 – Fire Resistant Materials 18
5-3 – Industrialized Houses 20

Layout Plan of the Exhibition Center of BCJ 23

I. Introduction to the Building Regulations in Japan

1. General Structure of the Legal System in Japan

— The taxonomy and priority of laws —

1) The Constitution

2) Laws: Promulgated as laws after the decision by the Diet

3) Administrative Orders (by the central Government under the provisions of the respective laws)

   i) Cabinet orders
   ii) Minister's orders
   iii) Orders by central agencies

4) Orders by the Local Governments

   i) Local ordinances: Promulgated after the decision by the local congresses
   ii) Local administrative orders by the local governors

2. Building Standard Law (enforced in 1950)

1) Its Unique Characteristics

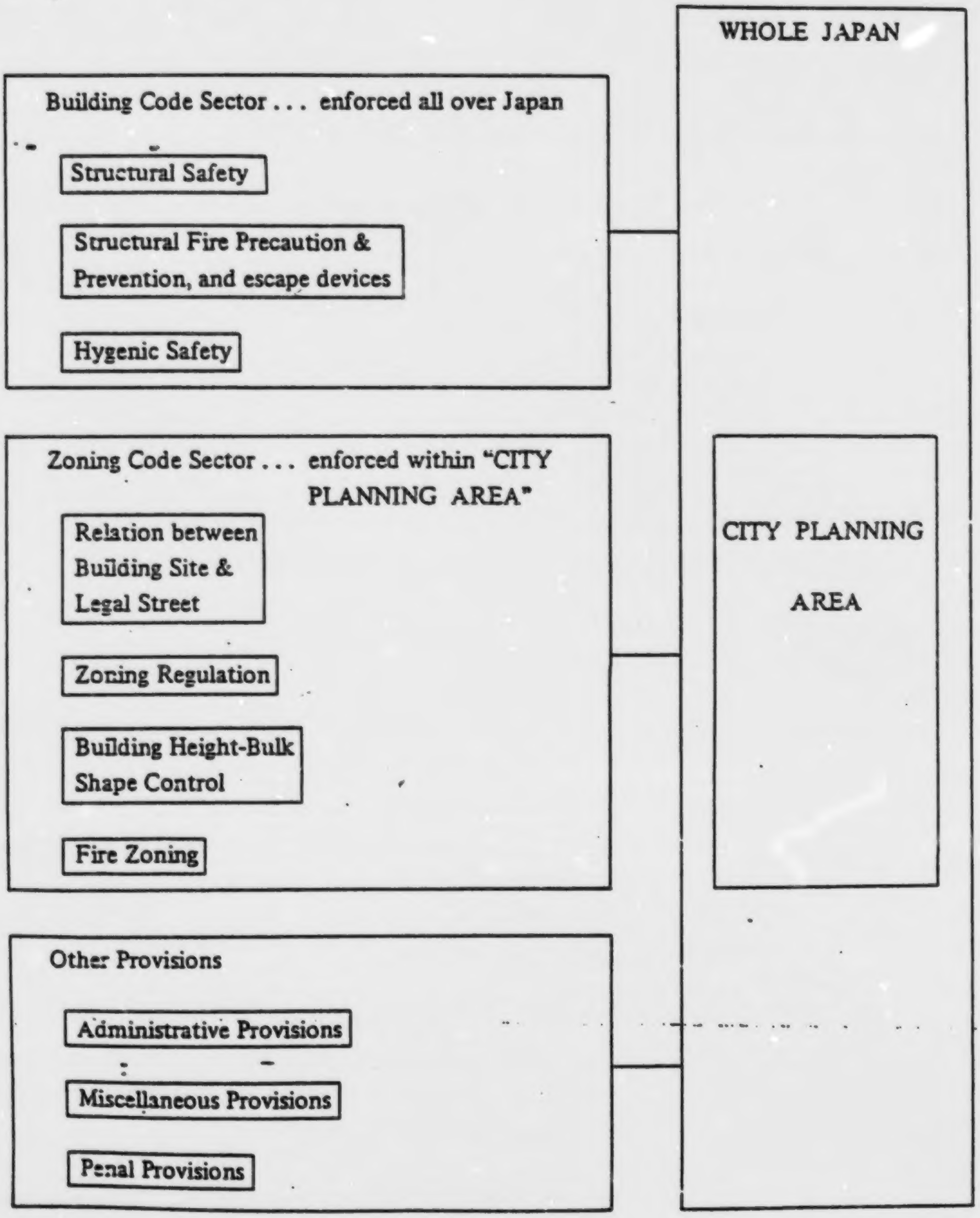
   i) Integrity: Including Building Codes, Zoning Codes, Housing Codes, Structure Codes, and so forth, which in most foreign developed countries are enforced individually and separately.

   ii) Nation-wide Application

   iii) Administrative Judgement by the Building Officials:
   Building officials of the local governments being entrusted with judgement as to the conformity to the law through the issuance of the "Building Permits".

   vi) Fundamentality: Its technical standards being applicable for buildings, sites and equipments provided for in other laws and orders.

2) Construction of the Law


WHOLE JAPAN
Building Code Sector . . . enforced all over Japan
Structural Safety
Structural Fire Precaution & Prevention, and escape devices
Hygenic Safety
Zoning Code Sector . . . enforced within "CITY PLANNING AREA"
Relation between Building Site & Legal Street
Zoning Regulation
Building Height-Bulk Shape Control
Fire Zoning
CITY PLANNING AREA
Other Provisions
Administrative Provisions
Miscellaneous Provisions
Penal Provisions

3) General Provisions

Procedures for a Building Permit to be granted by the Building Official are defined. Before building construction and occupancy changes take place (except in the case of small buildings in which the floor area is less than $10\ m^2$, outside the CITY PLANNING AREA), the plan shall be submitted to the Building Official, and a Building Permit shall be granted if the requirements are met.

4) Building Code Sector

Major requirements are as follows:

i) Structural Strength

(a) General requirements on construction methods and materials
(b) Methods of structural analysis
(c) Definition of loads: Live loads
Dead loads
Snow loads
Seismic force
Wind pressure
Other loads forces and vibrations
(d) Allowable stress of materials and limit strength of materials

ii) Fire Precautions and Prevention

(a) Non-combustibility of materials, components, and building
(b) Fire resisting performance of building
(c) Fire partitions: walls, floors, doors, etc.
(d) Standards for emergency elevators-escape-lighting, smoke control devices, fire-eliminating devices, lighting conductors, electrical gas equipment, etc.

5) Supplementary Orders

i) Enforcement ordinances
ii) Detailed enforcement regulations
iii) Official notifications

3. Other Laws and Orders Relating to Building Regulations

1) Fire Service Act, Labor and Sanitary Laws

2) Laws regulating buildings of specific services;

- schools, hospitals, pharmacies etc.
- storage of explosives, high pressure gas etc.

3) Laws relating to Urban Planning, Land Use, Environment Protection, Anti-Pollution, Urban Redevelopment etc.

II. Technical Appraisal System of BCJ

1. Legal Basis

1) Article 38, Chapter II (Building Site, Construction and Building Equipments) of the Building Standard Law, provides as follows, leaving room for legal adjustability to the technical development in the future;

> "with respect to buildings using special materials or construction methods that are not contemplated in the provisions of this chapter and other relevant orders and ordinances, such provisions shall not apply when the Minister of Construction deems such materials or methods to be equal or superior to those contemplated hereunder."

2) In 1965, an administrative order entrusted BCJ with the function of technical appraisal, a pre-requisite step prior to the authorization by the Minister of Construction, as required under the provisions of Article 38. It was just after the establishment of BCJ.

3) Ever since, the scope of BCJ's technical appraisal has been expanding following a series of administrative orders. It should be noted that among others, in 1973, BCJ commenced the technical appraisal and performance grading of industrialized houses, thus helping to bring about the subsequent rush of housing industrialization.

2. Role of BCJ

When plans are made to construct a building in Japan, the building structure, equipments and materials must be designed under the Building Standard Law and its related regulations.

The Building Standard Law provides detailed rules about various building materials and construction methods. Prior to the start of building, the question of whether the planned building conforms to such regulations or not must be investigated.

In the case of its conformance being confirmed, construction of the building may be started after obtaining a building permit issued by a relevant building official.

In other cases, when, for example, plans are made to use newly developed materials or to introduce a new method, the special approval of the Minister of Construction must be obtained after its safety has been ascertained through the checking of the structural calculations together with necessary test results, drawings and other data and information.

As a prerequisite for the Minister's approval, the proposed technique has to be checked through the technical appraisal system of BCJ. For this special purpose, BCJ has organized technical evaluation committees consisting of experts, including university professors, participating from all sectors in Japan in order to offer their expertise.

We have now 18 permanent technical evaluation committees, with the number of members amounting to 400. The items of technical issues which have been appraised through this BCJ system reached 9.600, as of the end of March, 1982 ..... (cf. the attached Table 1)

3. Proceedings for Initiating the Technical Appraisal System

We have, in most cases, application manuals for each of the evaluation committees with references and explanatory notes, according to which the necessary data and documents have to be compiled and submitted.

The following supplementary documents are the minimum required in order to proceed with this appraisal system.

(For buildings)

1) Floor plans, elevations, sections, detailed structural drawings (a framing plan, for example, fully explaining the characteristics of the important constituent parts in calculation of the structural strength) and detailed drawings of the joints and connections.

2) Structural Calculation Sheets and Reports

   The Building Standard Law Enforcement Order, chapter III, sub-chapter 8, provides for the rules, which must be complied with in preparing the following calculations and data.

   i) Combination of stresses required for designing the section (stress under permanent loading and stress under temporary loading) and conditions of stress (dead loads, live loads, snow loads, wind pressure and seismic force)

   ii) Calculation of required rates of relative storey displacement per building height and of the required strength of each storey against horizontal force.

iii) Methods of calculatin of loads and external forces
iv) Allowable unit stresses and strength of materials

3) Test record reports

Results of various tests necessary for the technical evaluation of the strength or performances of the proposed materials or for justifying the proposed structural calculations as specified in the Building Satandard Law Enforcement Order chapter III.

Japan Industrial Standards (JIS) prescribe the test methods and procedures. But in some cases there are no such provisions. That is one of the reasons that advance consultation of BCJ on how to carry out the test is advised.

(For building materials)

The following is an example of a newly developed fire resisting material:

1) Specifications

   i) Shape and dimensions
   ii) Specific gravity
   iii) Moisture content
   iv) Chemical analysis

2) Explanatory data on the production process and the quality control system (regarding basic material as well as processing material)

3) Results of tests performed at authorized laboratories

4) Drawings of standard construction methods

5) Other related information

When an application is submitted, a preliminary hearing will be held by some of the members of the respective evaluation committee.

When the evaluation is finalized, BCJ will issue an evaluation report.

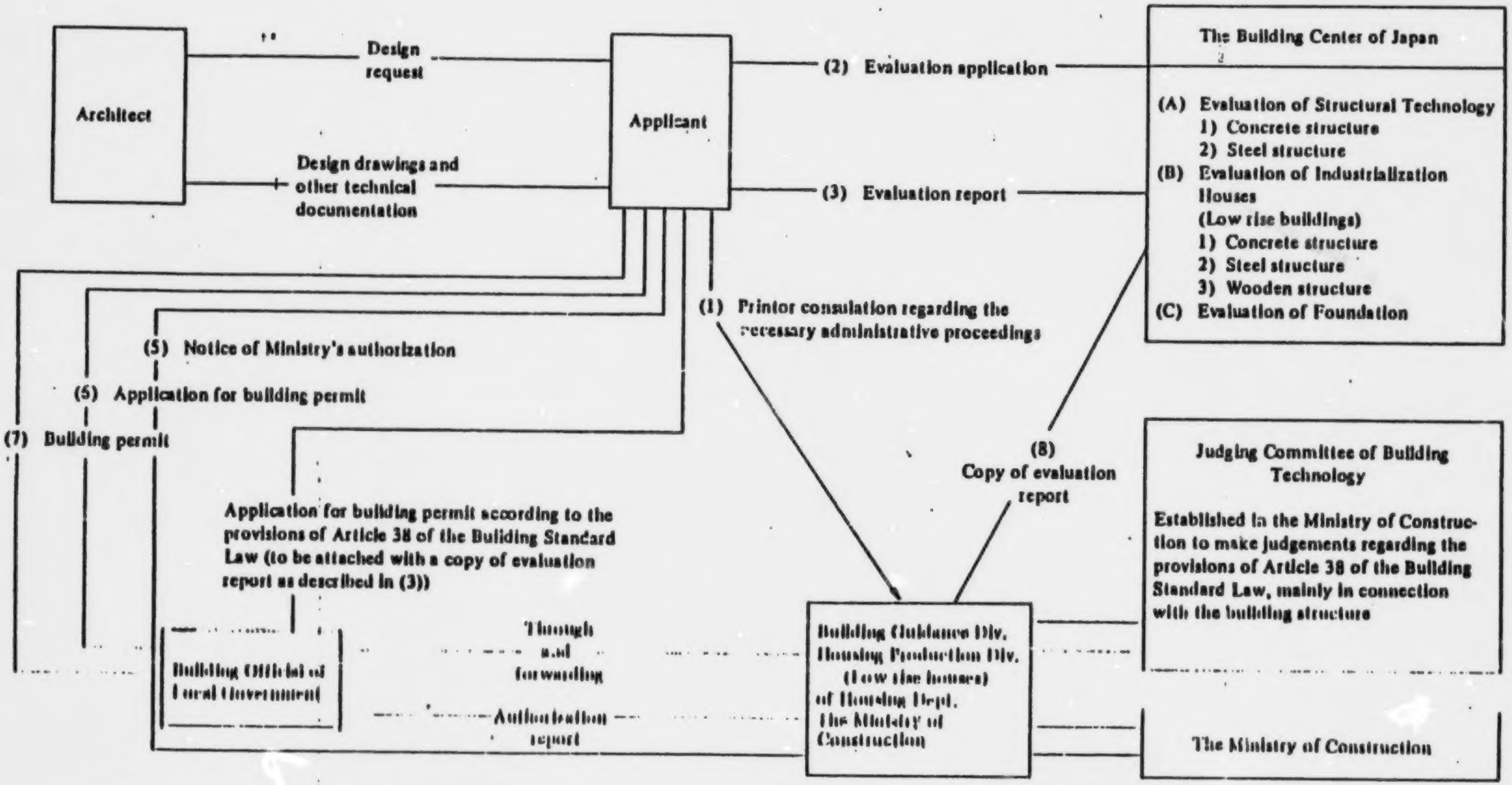
The application to the Minister of Construction for an authorization must be attached with a copy of this report together with necessary documents.

..... (cf. the attached Tables 2, 3, 4)

Table 1 Evaluation Committees

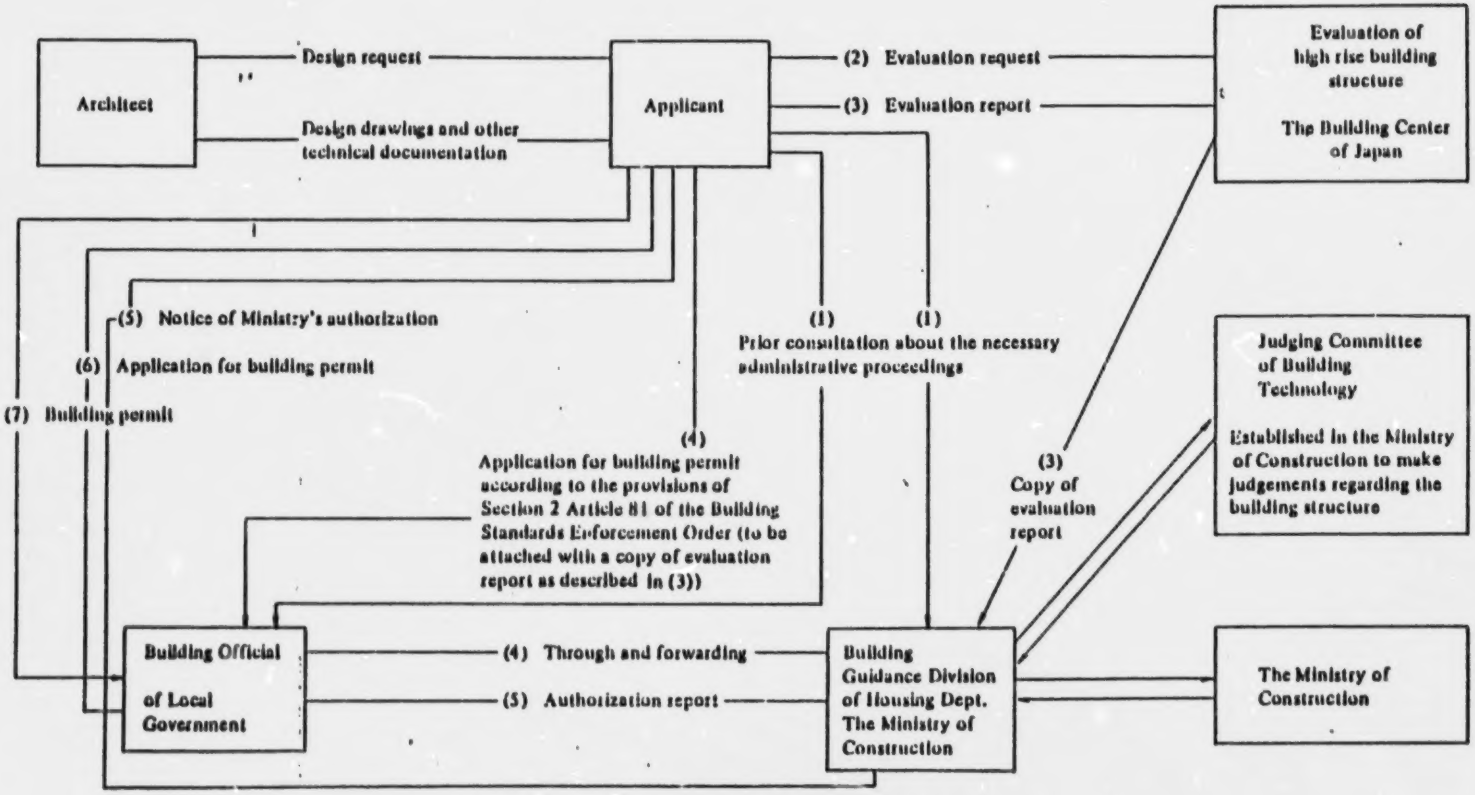
1. Technology for high rise buildings (More than 60 meters in height)
2. Structural technology (No more than 60 meters in height)
3. Building foundations
4. Computer programming
   Small capacity
   Large capacity
5. Silos
6. Blast furnace slag as aggregates for concrete
7. Artificial light weight aggregates
8. Sheets for safety during construction
9. Septic tanks
10. Elevators and play facilities
11. F.R.P.
12. * Industrialized houses
13. Durability
14. Fire resistance performance
15. Disaster prevention measures and facilities
16. Acoustic insulation structure
17. Fire resistant building process
18. Fire precaution and prevention plan

Table 2 Flow Chart of Evaluation Authorization and Permit According to the Provision of Article 38 of the Building Standard Law


Architect
Design request
Design drawings and other technical documentation
Applicant
(2) Evaluation application
(3) Evaluation report
The Building Center of Japan
(A) Evaluation of Structural Technology
1) Concrete structure
2) Steel structure
(B) Evaluation of Industrialization Houses
(Low rise buildings)
1) Concrete structure
2) Steel structure
3) Wooden structure
(C) Evaluation of Foundation
(1) Printor consulation regarding the necessary administrative proceedings
(5) Notice of Ministry's authorization
(5) Application for building permit
(7) Building permit
(8) Copy of evaluation report
Judging Committee of Building Technology
Established in the Ministry of Construction to make judgements regarding the provisions of Article 38 of the Building Standard Law, mainly in connection with the building structure
Application for building permit according to the provisions of Article 38 of the Building Standard Law (to be attached with a copy of evaluation report as described in (3))
Building Official of Local Government
Through and forwarding
Authorization report
Building Guidance Div. Housing Production Div. (Low rise houses) of Housing Dept. The Ministry of Construction
The Ministry of Construction

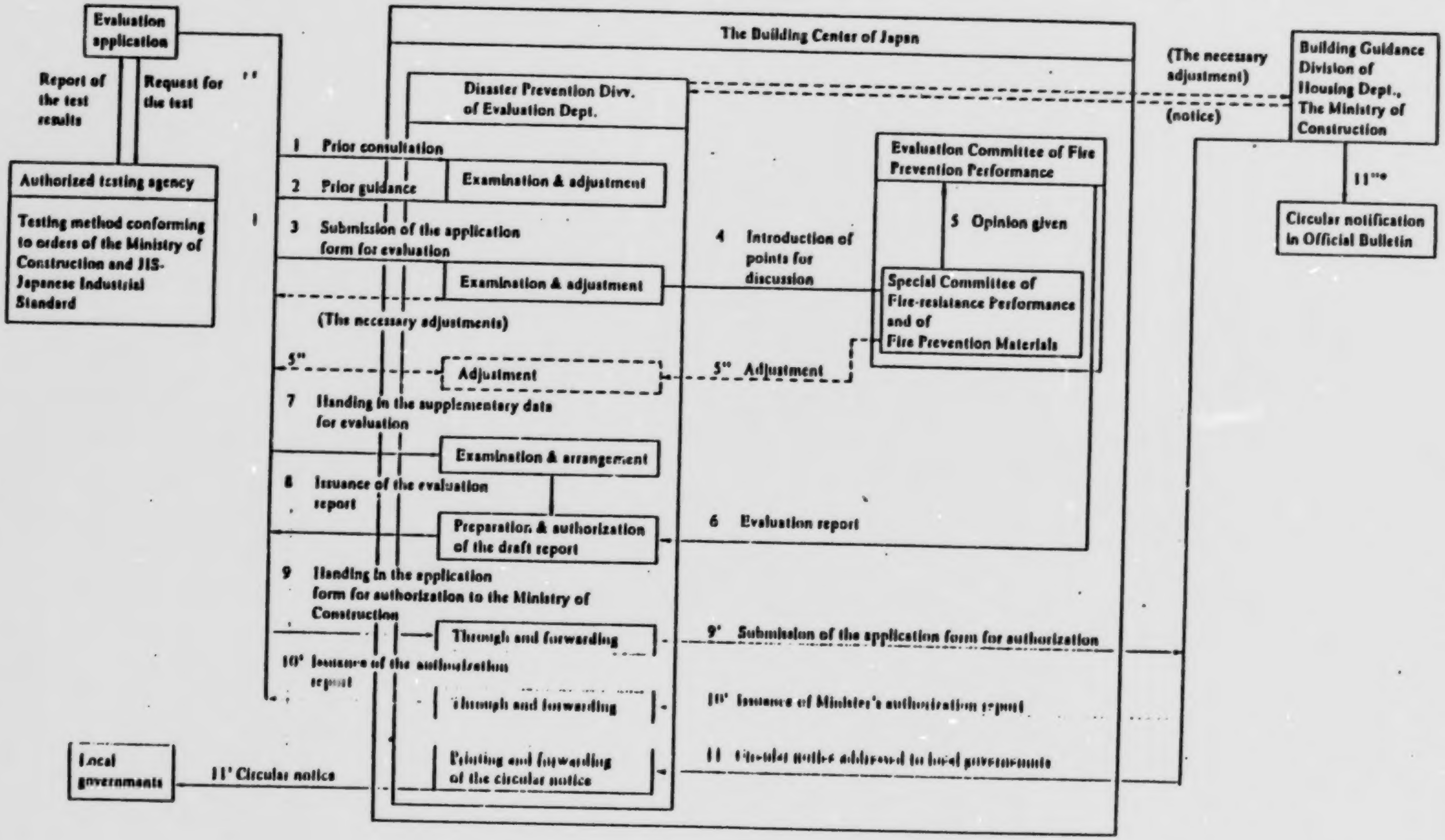
* Applicant shall attach the notice of Ministry's authorization and the request documents for a building permit.

Table 3 In Case of High Buildings, Conforming to the Provision of Section 2, Article 81 of the Building Standard Enforcement Order


Architect
Design request
Design drawings and other technical documentation
Applicant
(2) Evaluation request
(3) Evaluation report
Evaluation of high rise building structure
The Building Center of Japan
(1) (1)
Prior consultation about the necessary administrative proceedings
(5) Notice of Ministry's authorization
(6) Application for building permit
(7) Building permit
(4)
Application for building permit according to the provisions of Section 2 Article 81 of the Building Standards Enforcement Order (to be attached with a copy of evaluation report as described in (3))
(3) Copy of evaluation report
Judging Committee of Building Technology
Established in the Ministry of Construction to make judgements regarding the building structure
Building Official of Local Government
(4) Through and forwarding
(5) Authorization report
Building Guidance Division of Housing Dept. The Ministry of Construction
The Ministry of Construction

- Application shall attach the notice of Ministry's authorization and request documents for a building permit.

Table 4 Flow Chart of the Proceedings for Evaluation of Fire Prevention Performance


Evaluation application
Report of the test results
Request for the test
Authorized testing agency
Testing method conforming to orders of the Ministry of Construction and JIS-Japanese Industrial Standard
The Building Center of Japan
Disaster Prevention Divv. of Evaluation Dept.
1 Prior consultation
2 Prior guidance
Examination & adjustment
3 Submission of the application form for evaluation
Examination & adjustment
(The necessary adjustments)
5''
Adjustment
7 Handing in the supplementary data for evaluation
Examination & arrangement
8 Issuance of the evaluation report
Preparation & authorization of the draft report
9 Handing in the application form for authorization to the Ministry of Construction
Through and forwarding
10' Issuance of the authorization report
Through and forwarding
Printing and forwarding of the circular notice
Local governments
11' Circular notice
4 Introduction of points for discussion
5'' Adjustment
6 Evaluation report
9' Submission of the application form for authorization
10' Issuance of Minister's authorization report
11 Circular notice addressed to local governments
Evaluation Committee of Fire Prevention Performance
5 Opinion given
Special Committee of Fire-resistance Performance and of Fire Prevention Materials
(The necessary adjustment)
(notice)
Building Guidance Division of Housing Dept., The Ministry of Construction
11''*
Circular notification in Official Bulletin

* Only concerning the fire-resistant structure

Table 5 List of Technologies Evaluated by B.C.J.

Items	1978	1979	1980	1981	1982 1st half	Total
1) Computer models				28	3	31
2) High rise buildings (higher than 31 m to 45 m)	6	21	3	3	5	38
3) High rise buildings (higher than 45 m to 60 m)	7	1	9	8	7	32
4) High rise buildings (higher than 60 m to 100 m)	7	9	14	15	8	53
5) High rise buildings (higher than 100 m)	5	5	2	6	1	19
6) Construction of box frame type using reinforced concrete	8	8	0	2	0	18
7) Construction of box frame type using precast reinforced concrete	8	7	16	5	2	38
8) Precast Rahmen (rigid frame) construction	2	3	1	2	0	8
9) Concrete construction requiring the Ministry's authorization except 6) – 8)	11	10	9	8	0	38
10) Mechanical jointing process of reinforcing bars					13	13
11) Buildings evaluated under specific instructions from building officials of local authorities				4	7	11
12) Steel structure buildings requiring specific authorization of the Ministry of Construction	9	4	6	4	12	35
13) High tensile strength bolt of special type					10	10
14) Piles of high strength	19	23	31	33	9	115
15) Continuous underground walls	3	7	5	11	3	29
16) Aggregates of BF slag for concrete	15	0	0	0	7	22
17) Silos	9	12	41	16	2	80
18) Septic tanks (Individual)				163	37	200
19) Septic tanks (Multiple type)	121	89	82	71	32	395
20) Quality of FRP for septic tanks	3	6	0	17	4	30
21) Elevators, Escalators	15	22	21	38	15	111
22) Play facilities	9	31	10	16	4	70

Table 5-1 – HIGH RISE BLDG.

High Rise Bldgs evaluated by BCJ
(By fiscal year, height and usage)

Total 400, as of the end of Dec. 19[illegible]

Year	– 1966	13
	1967 – 1968	34
	1969 – 1970	62
	1971 – 1972	79
	1973 – 1974	62
	1975 – 1976	37
	1977 – 1978	39
	1979 – 1980	44
	1981 – 1982	30
Height	– 45	2
	45 – 60	119
	60 – 80	147
	80 – 100	59
	100 –	73
Usage	Cooperative houses	33
	Office bldg	202
	Hotels	54
	Governmental offices	47
	Hospitals	14
	Station bldg	4
	School	3
	Chimneys, towers, power houses	43

HIGH RISE BLDGS EVALUATED BY BCJ

(More than 100 m in height)

Name of BLDG	Evaluation No.	Date of Completion	Construction Site	Max. Height (m)	No. of Storeys		Total Floor Area (m²)	Type of Structure	Shear Modulus		Natural Period		Damping Ratio	Adopted Seismic Wave as Input Data	Acceleration of Input Data	Usage
					Above	Under			1 F	Top F	1st	2nd				
Kasumigaseki Bldg.		4/'68	TOKYO	147.0	36	3	153,223	STEEL			4.02	1.14		EL, T_1, S_1	0.1(G) 0.3(G), 0.5(G)	Office
Tokyo Kaijo-Kasai Ins. Bldg.	H 11	4/'74	〃	130.6	32	5	71,290	〃	0.07	0.42	0.43 0.41		0.02	EL, EL' TA, T_1	0.03(G)	Office
World Trade Center	H 21	3/'70	〃	152.0	40	3	154,336	〃	0.05 (3F)		4.17		0.03	EL, TA T_1, S_1	300	Office
Asahi-Tokai Bldg.	H 37	7/'71	〃	113.1	30	4	49,902	〃	0.09	0.36	3.38 3.45	1.21 1.25	0.02	EL, EL' TA', T_1, S_1	200, 400	Office
Keio Plaza Hotel	H 50	4/'71	〃	169.7	47	3	114,061	〃	0.06 (3F)		3.85 4.30		0.03	EL, TA T_1, S_1	300	Hotel
International Telecommunication	H112	9/'74	〃	151.2	32	3	126,693	〃	0.08	0.42	4.31 4.39	1.53 1.55	0.03	EL, TA T_1, S_1	100, 300, 500	Telecom.
Mitsui Bussan Otemachi Bldg.	H140	10/'76	〃	100.0	24	4	124,779	〃	0.13	0.29	2.35 1.98	0.89 0.69	0.03	EL, TA T_1, S_1	100, 200, 300	Office
Shinjuku Sumitomo Bldg.	H147	3/'74	〃	200.2	52	4	176,443	〃	0.07	0.36	5.07	1.67	0.01	EL, TA' HA, T_{10}	319, 175 225, 30	Office
Hotel New Otani Tower	H148	8/'74	〃	127.1	39	2	80,412	〃	0.06	0.23	4.7	1.7	0.02	EL, TA, HH	420, 620	Hotel
Shinjuku Mitsui Bldg.	H151	10/'74	〃	211.3	55	3	179,955	〃	0.03	0.46	5.08 5.18	1.54 1.69	0.03	EL, TA T_1, S_1	100, 300, 500	Office
Toho Life Ins. Bldg.	H156	3/'75	〃	131.0	31	4	61,974	〃	0.11	0.28	3.50 3.02	1.14 0.99	0.03	EL, TA T_1, S_1	250, 300	Office
Mita Bldg.	H173	6/'75	〃	106.4	26	3	111,663	〃	0.10	0.38	3.09 3.30	1.15 1.03	0.02	EI, TA, T_1	250, 400	Office
Yasuda Kasai Kaijo Ins. Bldg.	H170	2/'76	〃	193.0	43	6	134,485	〃	0.07	0.30	4.78 4.31	1.98 1.83	0.02	EL, TA, T_1	250, 500	Office
New [illegible] Bldg.	[illegible]	[illegible]	〃	[illegible]	[illegible]	4	49,844	〃	0.15	0.33	2.06 1.96	0.74 0.70	0.02	EL, EL' TA, TA'	250, 400	Office
Sunshine 60	[illegible]	4/'78	〃	[illegible]	60	[illegible]	[illegible]	〃		[illegible]	[illegible]	[illegible]	[illegible]	EL, TA T_1, S_1	[illegible]	Office
Shinjuku Nomura Bldg.	H233	10/'78	〃	209.9	53	5	117,582	〃	0.05 0.06	1.0	5.42 4.27	2.12 1.65	0.02	EL, TA T_1, S_1	250, 400	Office
Mitsubishi Bank	H245	6/'80	〃	110.7	24	5	122,296	〃	0.14	0.42	2.31 2.62	0.85 0.99	0.02	EL, TA, T_1 T_1, T'_1, T_2, T'_2	250, 400	Office
Taiyo Fishery Company	H256	11/'78	〃	100.0	24	4	75,292	〃	0.12	0.36	2.39 2.37	0.72 0.88	0.02	EL, TA, T'_2	{200 360 {330 390 {320 370	Office

Name of BLDG	Evaluation No.	Date of Completion	Construction Site	Max. Height (m)	No. of Storeys		Total Floor Area (m²)	Type of Structure	Shear Modulus		Natural Period		Damping Ratio	Adapted Seismic Wave as Input Data	Acceleration of Input Data	Usage
					Above	Under			1 F	Top F	1st	2nd				
Daiichi-Kangyo Bank	H269	9/'80	"	144.0	32	4	134,880	STEEL	0.09	0.28	3.57 3.78	1.17 1.23	0.02	EL, EL' TA, T_1, S_1	0.25(G), 0.40(G)	Bank
Fukoku Life Ins. Bldg.	H273	1/'80	"	120.0	30	5	89,547	"	0.10	1.07	3.06 3.24	1.05 1.09	0.02	EL, TK TK', TA, T_1	400, 240 203, 293, 380	Office
Shinjuku Center Bldg.	H286	11/'79	"	223.0	55	5	183,064	"	0.06	0.34	5.64 5.35	1.81 1.84	0.02	EL, TA HA, HJ	250, 500	Office
Sunshine Prince Hotel	H297	3/'80	"	121.6	37	4	86,910	"	0.09 0.10	0.30 0.33	3.81 3.40	1.21 1.12	0.02	EL, TA T_1, S_1	250, 400	Hotel
Odakyu Hotel Century	H305	8/'80	"	114.5	28 26	4	172,967	"	0.13 0.13	0.60 0.47	2.31 2.42	0.97 0.96	0.02	SJ, EL, TA	500 {250 {330 750 {400 {500	Hotel Office
Keio Plaza Hotel South Building	H311	9/'80	"	132.1	35	3	58,134	"	0.11	0.37	3.00 2.80	0.98 0.83	0.02	EL, TA, T_1 S_1, T_{10}, T'_{10}	25(K), 50(K)	Hotel
Akasaka Prince Hotel	H314	6/'82	"	138.9	39	2	69,689	"	0.11	0.61	4.08 3.95	3.37 1.21	0.02	EL, TA T_1, S_1	250, 400	Hotel
Minato Tatemono Bldg.	H319		"	165.1	40	3	163,728	"	0.07	0.33	4.11 4.08	1.37 1.31	0.02	EL, TA, T_1, SR	230 270 330 660 350 400 500 990	Office
Imperial Tower	H325	12/'82	"	118.9	31	4	94,636	"	0.12	0.60	2.98 2.90	1.05 1.07	0.02	EL, TA HA, T_1	25(K), 50(K)	Hotel
Joint Ministries Central Bldg. No.5	H328		"	100.0	26	3	92,725	"	0.16	0.50	2.24 2.22	0.71 0.73	0.02	EL, TA, TA' T_1, HA	25(K), 50(K)	Office
Hibiya Kokusai Bldg.	H330	10/'81	"	127.9	31	5	128,462	"	0.08	0.168	3.88 3.73	1.39 1.29	0.02	EL, TA, T_1, S_1 O_s, T_8, HA, TA'	30(K), 50(K)	Office
Shinjuku NS Bldg.	H334	8/'82	"	121.5	30	3	166,036	"	0.12	0.33	2.46 2.60	0.90 0.98	0.02	EL, TA, T_1 S_1, T_{10}, T'_{10}	25(K), 50(K)	Office
Osaka Data Communication	H 91	1/'73	OSAKA	130.0	24	3	120,134	"	0.09 0.10	0.31 0.36	3.46 3.37	1.35 1.24	0.02	EL, TA, T_1 S_1, O_s, HA	0.25(G), 0.45(g)	Data Communication
Osaka [illegible] Bldg.	H 94	8/'71	"	119.8	33	3	98,[illegible]	"	0.07	0.13	3.91	1.27	0.02	EL, O_s	[illegible]	Office
Osaka Kokusai Bldg.	H 96	4/'73	"	[illegible]	32	3	89,067	"	0.12	0.17	3.97	1.28	0.02	EL, EL', TA TA', O_s, O'_s	[illegible]	Office
Osaka Royal Hotel	H106	10/'73	"	[illegible]	30	4	149,[illegible]	"	0.10 0.11	0.61 1.40	4.41 3.16	1.48 1.16	0.02	EL, TA, O_s	[illegible]	Hotel
Nakanoshima Center Bldg.	H113	7/'73	"	128.4	35	3	91,739	"	0.14	0.35	3.84 3.82	1.32 1.30	0.02	EL, TA	0.25(G), 0.45(G)	Office
Yoshimoto Bldg.	H214	3/'76	"	113.5	30	4	41,312	"	0.08	0.27	3.41	1.18	0.02	O_s, EL, TA	200, 300	Hotel
Hankyu Grand Bldg.	H216	7/'77	"	120.8	32	3	72,144	"	0.08	0.26	4.35	1.59	0.02	EL, EL' TA, O_s, O'_s	200, 300	Office
3 Osakaekimae Bldg.	H253	9/'79	"	142.0	34	4	121,276	"	0.11	0.25	4.19 4.08	1.39 1.36	0.02	EL, TA, O_s	200, 330	Office

Name of BLDG	Evaluation No.	Date of Completion	Construction Site	Max. Height (m)	No. of Storeys		Total Floor Area (m²)	Type of Structure	Shear Modulus		Natural Period		Damping Ratio	Adopted Seismic Wave as Input Data	Acceleration of Input Data	Usage
					Above	Under			1 F	Top F	1st	2nd				
Nankai Namba Station High High Rise Hotel	H258		"	139.0	38	3	83,284	STEEL	0.11 0.09	0.42 0.63	3.08 3.91	1.30 1.55	0.02 0.015	EL, TA O_3, AT	0.2(G), 0.3(G)	Hotel
4 Osakachimae Bldg.	H294	2/'81	"	100.0	25	4	98,808	"	0.15 0.14	0.35 0.40	2.26 2.57	0.82 0.95	0.02	EL, EL', TA O_3, HA, HA'	200, 300	Office
Osaka Terminal Bldg.	H332		"	111.0	27	4	130,632	"	0.125	1.00	2.89 2.84	1.17 1.10	0.02	EL, TA, O_3	30(K), 45(K)	Hotel
Osaka Midosuji Bldg.	H335	8/'82	"	110.6	32	4	59,082	"	0.19 0.15	0.53 0.60	2.43 2.46	0.94 0.97	0.02	EL, TA, O_3	0.2(G), 0.3(G)	Hotel
Kobe Trade Center	H22	11/'69	KOBE	107.0	26	2	44,990	"	0.08 (2F)	0.26	3.42	1.19	0.02 0.03	O_1, O_2, AK S_1, TA, EL	0.2(G) 0.3(G), 0.4(G)	Office
Kobe Portpia Hotel	H317	3/'81	"	111.4	31	2	59,393	"	0.08	0.32	3.49 3.60	1.37 1.39	0.02	EL, TA KO, O_3	200, 350	Hotel

Adopted Seismic Wave as Input Data

EL : EL CENTRO 1940 NS
TA : TAFT 1952 EW
T_1 : TOKYO 101 1956 NS
T_3 : " 112 NS
T_6 : " 120 1968 NS
T_7 : " 133 1963 NS
T_8 : " 133 1968 NS
T_{10} : " 141 1968 NS
S_1 : SENDAI 501 1962 NS
O_1 : OSAKA 210 1963 NS
O_2 : " 205 1963 EW
O_3 : " 206 1963 NS
AK : AKASHI 804 1963 EW
AT : ATSUMIHANTO-OKI 1971
HA : HACHINOHE 1968 NS
HJ : HANCHIIYO 1972 EW
HN : HINO (CHIYODA-KU) 1968 EW
KO : KOBE 1969 NS
P_1 : PORT-ISLAND-KP+2.8 1974 EW
SJ : SHINJUKU 1972 EW
SR : SHIBAURA 1977 EW
TK : TOKACHI OKI 1968 NS

* Where accompanied by an apostrophe, the direction should be read as the reverse.

(Ex.) TA' : TAFT 1952 NS

Acceleration of Input Data

with no indication: gal
(G) : gravity Acceleration
(K) : kine

Table 5-2. Fire Resistant Materials Restrictions on Internal Linings

Buildings classification according to its use, scale, structure or fire-resistant compartmentation		Scale as applied to			Limitations of interior finishing materials for ceiling and wall										Remark
		Fire Resistant Buildings	Semi Fire Resistant Buildings	Other Buildings	Rooms					Corridors, Stairways or Other Passages					
					[illegible]-ing		Finish-ing			[illegible]-ing		Finish-ing			
					B	A	C	B	A	B	A	C	B	A	
Theater, Movie Theaters, Vaudeville Houses, Exhibition Halls, Public Halls, Assembly Halls, etc.		Floor Area with 400 sq-meters or more of spectator seats	Floor Area with, 100 sq-meters or more of spectator seats.		—	—	Δ	○	○	—	—	/	○	○	► Order 129-I
Hospitals, Clinics (having facilities of hospital treatment), Hotels, Inns, Lodges, Apartments, Boarding Houses, Asylums for the aged, Welfare Institutions for children, etc.		Floor Area of the 3rd floor and/or upper floor totaling 300 sq-meters or more (see *1)	Floor Area of the 2nd floor totaling 300 sq-meters or more (see *2)	Floor Area totaling 200 sq-meters or more	—	—	Δ	○	○	—	—	/	○	○	*1 Except for compartments of 100 m^2 or less (► Order 129-I) *2 This restriction applies to hospitals if there are patient rooms on the floor
Department Stores, Markets, Show Rooms, Sport Stadiums, Cabarets, Cafés, Nightclubs, Bars, Dance Halls, Public Bathhouses, Waiting Rooms, Restaurants, Sales Shops		Floor Area of the 3rd floor and/or upper floors totaling 1,000 sq-meters or more	Floor Area of the 2nd floor totaling 500 sq-meters or more	Floor Area totaling 200 sq-meters or more	—	—	Δ	○	○	—	—	/	○	○	► Order 112-VI ► Order 128-4-I
Rooms used for the purposes described in (1), (2) and (3) which are located underground.		All			—	—	Δ	○	○	—	—	/	○	○	► Order 128-4-I-iii ► Order 129-III
Garages, Auto Repair Shops		All			—	—	Δ	○	○	—	—	/	○	○	► Order 128-4-I-ii, 129-II
Rooms having no window for lighting	with total floor area of 50 sq-meters or more	All			—	—	Δ	○	○	—	—	/	○	○	
	requiring temperature and humidity control	All			—	—	Δ	○	○	—	—	/	○	○	► Order 128-3-II ► Order 129-V
Applicable regardless of the usage (see *3 and *4)		• Buildings of 500 sq-meters or more in total area, with 3 or more stories • Buildings of 1,000 sq-meters or more in total area with 2 stories • One story Buildings of 3,000 sq-meters or more in total area			—	—	○	○	○	—	—	/	○	○	*3 Except schools and gymnasiums *4 Buildings of 31 meters or less in height and used for any of the uses described in (2) are included in classification (2) ► Order 129-IV proviso
Buildings, where facilities or equipment for utilizing fire are installed (Cuisines, Bathrooms, Drying Rooms, Boiler Rooms)		• Residences of 2 or more stories on any floor except the the highest one.			—	—	/	○	○	—	—	/	○	○	► Order 129-VI ► Order 129-4-IV
		• Buildings other than residences			—	—	/	○	○	—	—	/	○	○	
11th Floor and/or Upper Floors or buildings		• Fire-resistant compartment- not exceeding 100 sq-meters in area			—	—	○	○	○	—	—	/	○	○	► Order 112-V
		• Fire-resistant compartment, not exceeding 200 sq-meters in area (except for B-type fireproof doors)			○	○	/	○	○	○	○	/	○	○	► Order 112-VI
		• Fire-resistant compartment, not exceeding 500 sq-meters in area (except for B-type fireproof doors)			/	○	/	/	○	/	○	/	/	○	► Order 112-VII
Underground Stores, etc.		• Fire-resistant compartment, not exceeding 100 sq-meters in area			—	—	/	○	○	/	○	/	/	○	
		• Fire-resistant compartment, not exceeding 200 sq-meters in area (except for B-type fireproof doors)			○	○	/	○	○	/	○	/	/	○	► Order 128-3-III
		• Fire-resistant compartment, not exceeding 500 sq-meters in area (except for B-type fireproof doors)			/	○	/	/	○	/	○	/	/	○	► Order 128-3-V

Remarks

A: Non-Combustible Materials
B: Semi Non-Combustible Materials
C: Fire Retardant Materials
○: Allowed
/: Not allowed
—: No limitation
Δ: Allowed only for the portion under 3rd floor
Order: Building Standard Law Enforcement Order enacted in 1950 as a cabinet order No. 338

Fire Resistance Perfromance and Testing Methods

		Non-Combustible Materials	Semi Non-Combustibel Materials	Incombustible Materials	Semi Incombustible Materials	Related Regulations
Materials		· Concete · Bricks · Tile · Asbestos cement slate thickness ≧ 3.2 mm · Rock wool board thickness ≧ 9.8 mm · Iron sheet thickness ≧ 0.15 mm · Aluminium thickness ≧ 0.5 mm · Glass · Mortar · Lime plaster · Other materials authorized by the Minister of Construction	· Cemented excelsior board thickness ≧ 12 mm · Plaster board thickness ≧ 9 mm · Other materials authorized by the Minister of Construction	· Incombustible plywood · Incombustible fiber board · Other materials authorized by the Minister of Construction	· Reinforced polyester board · Vinyl chloride board · Other materials authorized by the Minister of Construction	Law 2-1-ix
Fire Resistance Performance		Against ordinary fire (1) Non-combustible (2) Non-deformable, Infusible, Non-cracking by fire (3) No generation of smoke and gas harmful to fire prevention and health	Against ordinary fire (1) Scarcely combustible (2) No generation of smoke and gas harmful to fire prevention and health	Against ordinary fire (1) Negligible occurrence of combustional phenomenon at the first stage of fire (2) Negligible generation of smoke preventing refuge and no generation of harmful gas	Against ordinary fire (1) Negligible occurrence of combustional phenomenon at the first stage of fire	Order 108-2 1-1-v 1-1-vi
Test for Elementary Materials 38 x 42 x (47–53) mm (3 Samples)		Max. increase of temperature shall be 50°C, during heating for 20 min. in a test oven at 750°C	—	—	—	
Surface Tests 22 x 22 cm (3 Samples)	Heating Conditions	E.G.T. shall be 305°C, 10 min. after start of heating		E.G.T. shall be 235°C, 6 min. after start of heating		Notification S45-1828 S51-1231
	Heating Time	10 min.		6 min.		
	Exhaust Gas Temp. (E.G.T.)	Max. increase of E.G.T. shall be 50°C	Max. increase of E.G.T. shall be 50°C, 3 min. after start of heating			
	Area of (Temp. x Time) [tdΘ]	0	Max. = 100	Max. = 350		
	Somake Generation [Cᴀ]	Max. = 30	Max. = 60	Max. = 120	—	
	Melting, Cracking	No melting through the entire thickness. No cracks through to the back surface more the 1/10 of the thickness, measured at the back surface.			—	
	Sustained Flaming	No sustained flaming lasting for over 30 sec. after the end of heating. No distortion harmful to fire prevention. No generation of intoxicating gas harmful to evacuation.				
Perforation Tests 22 x 22 cm (3 Samples)		—	Sample board shall be drilled, 3 holes (φ 25mm) and be heated for 10 min. Area (Temp. x Time) Max. = 150 Smoke Generation Max. = 60 Sustained flaming 90 sec.	—	—	
Gas Toxicity Tests 22 x 22 cm (2 Samples)		—	Measurement of time for sample mice (8) for 15 min. after the start of heating, although the heating shall last 6 min. The average time required for the mice to stop acting shall be more than that in the case of standard material (red lauan)		—	

Industrialized Houses

Number of Industrialized Houses, Evaluated by BCJ and Authorized by M.O.C.

(1st half)

Year / Classification	1978		1979		1980		1981		1982	Total
	9th	10th	11th	12th	13th	14th	15th	16th	17th	
Steel	15	6	9	25	7	14	6	14	12	108
Wooden	5	5	4	7	4	4	5	4	4	42
Concrete	7	2	4	2	2	10	4	0	1	32
Total	27	13	17	34	13	28	15	18	17	182

Housing Starts by the Type of Main Structure
(Calender Year)

(1,000)

	1978	1979	1980	1981	1982. 1–6
Housing Starts (Pre-fabricated Houses)	1,549 (139)	1,493 (137)	1,269 (127)	1,152 ([illegible])	550 (62)
Wooden Houses	955 (24)	910 (26)	751	654	
Steel "	184 (81)	191 (82)	166	157	
Concrete 2 others	410 (34)	392 (29)	352	341	

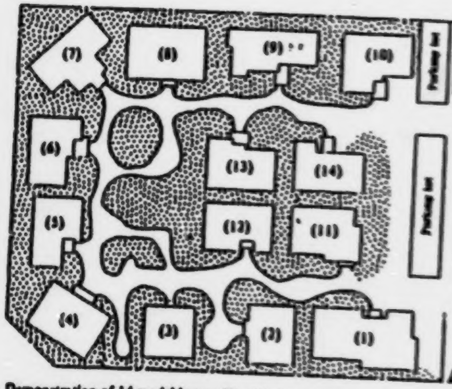
Checking Items for Evaluation of the Industrialized Houses

I. Safety

- (1) Structural Strength Performance
  - 1. Structural Strength Suitable or Not
  - 2. Design Conditions
    - 2-1. Bearing Capacity for Long Time Loading of Soil ______ t/m^2
    - 2-2. Vertical Deepest Snowfall ______ cm
    - 2-3. Velocity Press ______ Kg/m^2
    - 2-4. Horizontal Seismic Coefficient ______
    - 2-5. Live Load ______ Kg/m^2
- (2) Fire Proofing Performance
  - 1. Exterior Finishing
    - 1-1. Roof the ______ grade
    - 1-2. External Wall & Eaves' Back the ______ grade
    - 1-3. Opening the ______ grade
  - 2. Interior Finishing the ______ grade
    - 2-1. Jap. Style Room the ______ grade
    - 2-2. W. Style Room the ______ grade
    - 2-3. Kitchen the ______ grade
    - 2-4. Bath Room the ______ grade
  - 3. Partition Wall of Tenement House the ______ grade
- (3) Falling Down Prevention Performance Suitable or Not

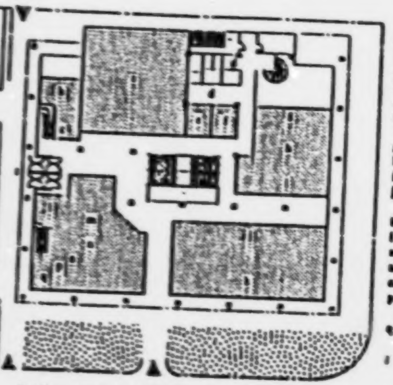
II. Living Comfortableness	
(1) Performance of Openings	Suitable or Not
(2) Ventilation Performance	Suitable or Not
(3) Performance Concerning Heat	
1. Heat Insulating Performance	
1-1. Roof	the grade
1-2. External Wall	the grade
1-3. Floor	the grade
2. Heat Reserving Performance	the grade
3. Dew Proofing Performance	Suitable or Not
(4) Performance Concerning Sound	
1. Sound Insulating Performance	
1-1. External Wall of Residential Room	the grade
1-2. Partition Wall between Bedrooms	the grade
1-3. Partition Wall of Tenement House	the grade
2. Insulating Performance of Floor Impulse Sound	the grade
3. Tranquility Performance of Housing Equipment	the grade
III. Durability	
(1) Rust, Rot & Termite Proofing Perfromance	Suitable or Not
(2) Water Proofing & Drainage Performance	Suitable or Not

LAYOUT PLAN OF THE EXHIBITION CENTER OF THE BUILDING CENTER OF JAPAN



Demonstration of 14 model houses (Pre-fabricated houses, "House 55" houses and a two-by-four house)

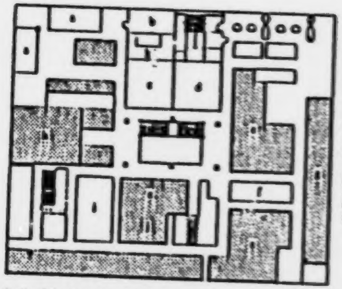
(1)	Taisei Corp.	: Palcon
(2)	Misawa Homes Co., Ltd.	: Misawa Homes House 55
(3)	Misawa Homes Co., Ltd.	: Misawa Homes M Type 3 Living
(4)	National House Industrial Co., Ltd.	: National House 55
(5)	Daiwa House Industry Co., Ltd.	: Sweet Homes 20
(6)	Sekisui Chemical Co., Ltd.	: Heim Skyward 3 Storied
(7)	Asahi Chemical Industry Co., Ltd.	: Hebel House
(8)	Resco House Co., Ltd.	: Resco House
(9)	Sekisui House, Ltd.	: Sekisui House Type 2-K IV ("Maison en [illegible]")
(10)	Sekisui Chemical Co., Ltd.	: Sekisui Heim M 3
(11)	Toyota Jutaku, an agent of National Houses	: Pana Home [illegible]
(12)	Mitsui Home Co., Ltd.	: Vivace
(13)	[illegible] Housing Co., Ltd.	: Field Maison 150
(14)	[illegible] Co., Ltd.	: [illegible] House 10



1st floor • Housing Display

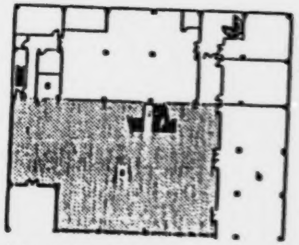
- a Building Contractors Society
- b Office
- c Reception
- d Rest room
- e VTR corner
- f Federation of All Japan Builders Association
- g The Tokyo Electric Co., Inc.
- h Public Energy services corner
- i 7 gas business companies
- j Japan Housing & Components Manufacturers Co-operation
- k Housing & Urban Development Corp.
- l ASTM (Ashiyahama Town Project)
- m Industrialized houses
- n Housing Loan Corp.
- o "House 55" competition corner
- p Japan Pre-fabricated Construction Suppliers & Manufacturers Association
- q Japan Two-by-four (2x4) Home Builders Association
- r Main Entrance

- Building Contractors Society: "Architecture & Community Planning – History & Building Technique"
- Housing & Urban Development Corp.: KEP, model apartment house – A new proposal by life sized display rooms of 120 square meters.
- Public Energy Services Corner: Display of housing facility systems by 7 gas supply companies including Tokyo Gas Co., Ltd. and The Tokyo Electric Co., Inc.
- Display of construction methods and characteristics: Industrialized houses authorized by the Minister of Construction, "House 55" houses, two-by-four wood frame construction houses, houses of traditional construction method, alteration and repair systems and Ashiyahama town project.
- Corner of Housing Loan Corp. for housing loan information services and a corner for houses remodelling services



- a Equipment
- b Office
- c Steel Products
- d Interior goods & materials
- e Sashes
- f Glass Products
- g Parts & components
- h Event Corner
- i Septic tank
- j Equipment & accessories
- k Rest room

2nd • Display of components, parts and equipment amounting to 2,500 products
Event corner (Festival hall): for temporary use



- a BL Components
- b Conference room
- c Rest room

Basement • Floors for Exhibitors

Display of BL (Better Living) Components qualified by the Minister of Construction (e.g. kitchen units, solar energy water system, bathroom units & water supply units)

The Building Center of Japan

14-16 Harumi 1-chome, Chuo-ku, Tokyo Tel. 03 (531) 8251

APPENDIX C:

JAS STRUCTURAL PLYWOOD

APPENDIX C

A-10

JAS

Japanese Agricultural Standard For

STRUCTURAL PLYWOOD

March, 1983

農林水産省

A LIST OF REVISION

P1 Exchange the lines from 3rd to 5th for the following sentence:

Notification No. 1709 of the Ministry
of Agriculture, Forestry and Fisheries
September 27th, 1983.

P5 Exchange all sentences of the item "Prohibited marking of Class 1" for the following sentences:

The following matters shall not be marked:
(1) Out-door-use and other term that will mean the panel will be able to use under the service condition of weather exposure. (Excluding the case of marking on the structural panels that come under Type Special, qualities of face and back veneers are comply with requirements prescribed in standards a, b or c of paragraph 2 and qualities of core and cross band veneers are comply with requirements prescribed in standard c of paragraph 2, notwithstanding the prescription of paragraph 3)
(2) Any term that contradicts the markings as required above
(3) Any wording or other indication that tends to cause misunderstanding of the quality of the product

P8 Insert the following item between " Total of the widthwise dimension of sound knot etc." and " Sound knot ":

Total number of defects of sound knot, dead knot, loode knot, knot hole, patch and decay		Any are 300 mm long and 600 mm wide across the grain, including white pocket shall not contain more than three of defects calculated according to the formulae prescribed in Appendix Table 2

P8 Exchange the word "Ditto" of the item "Decay of Class 2" for the following sentence:

Not permitted, but white pocket not severely injure the serviceability will be permitted

P18

Add the following table to the end of this standard:

Appendix Table 2 (Concerning Article 3-3, standards for core and cross band)

Item	Formulae for calculating the number of defects
Heavy white pocket	Width cross grain (mm) - 150
Light white pocket	Width cross grain (mm) - 300
Sound knot, dead knot, loose knot, knot hole and patch of more than 25 mm and not more than 40 mm in width cross grain	Number x ½
Sound knot, dead knot, loose knot; knot hole and patch of more than 40 mm and not more than 65 mm in width cross grain	Number x 1
Sound knot, dead knot, loose knot, knot hole and patch of more than 65 mm in width cross grain	Number x 3

Additional Provision

1. This notification is become effective on October 27th of 1983.

Only the Japanese-language texts are official and authentic. This publication is a temporary translation prepared solely for the convenience of interested persons. In the event of any doubt arising, it is at all times advisable to refer to the original Japanese text.

JAPANESE AGRICULTURAL STANDARD
FOR STRUCTURAL PLYWOOD

Notification No. 2047 of the Ministry
of Agriculture, Forestry and Fisheries
December 14th, 1982.

(Scope of Application)

Article 1. This standard shall be applied to structural plywood.

(Definition)

Article 2. The terms in the left column of the following Table shall be as used herein as defined respectively in the right column:

Terms	Definition
Structural plywood	Of the ordinary plywood (as prescribed by Article 2 of the Notification No. 383 of the Ministry of Agriculture, Forestry and Fisheries, April 11, 1964, establishing the Japanese Agricultural Standard For Ordinary Plywood), other than the plywood for fire-retardant shutters (as prescribed by Article 1 of the Notification No. 29 of the Ministry of Agriculture, Forestry and Fisheries, January 16, 1961, establishing the Japanese Agricultural Standard For Plywood For Fire-retardant Shutter), the plywood for concrete forms (as prescribed by Article of the Notification No. 932 of the Ministry of Agriculture, Forestry and Fisheries, June 30, 1967, establishing the Japanese Agricultural Standard For Concrete Form Plywood), fire retardant plywood (as prescribed by Article 2 of the Notification No. 1869 of the Ministry of Agriculture, Forestry and Fisheries, December 5, 1969, establishing the Japanese Agricultural Standard For Fire Retardant Plywood, plywood for scaffolds (as prescribed by Article 2 of the Notification No. 771 of the Ministry of Agriculture, Forestry and Fisheries, May 17, 1972, establishing the Japanese Agricultural Standard For Plywood For Scaffold), nonflammable plywood (as prescribed by Article 2 of the Notification No. 1650 of the Ministry of Agriculture, Forestry and Fisheries, September 11, 1972, establishing the Japanese Agricultural Standard for Nonflammable Plywood) and plywood for pallets (as prescribed by Article 2 of the Notification No. 6 of the Ministry of Agriculture, Forestry and Fisheries, January 7, 1977, establishing the Japanese Agricultural Standard For Plywood For Pallet), those plywood to be used for important parts from structural resistance in building constructions.

Type special	Structural plywood those are used outdoors, or at constantly wet places, and have passed the continuous boiling test as prescribed in Supplementary provisions 3 - (1).
Type I	Structural plywood those are used indoors, and have passed the repeated boiling test as prescribed in Supplementary provisions 3 - (2).

(Standards)

Article 3. The standards for structural plywood shall be specified as follows:

<table>
<tr><th rowspan="2">Items</th><th colspan="2">Standard Specification</th></tr>
<tr><th>Class 1</th><th>Class 2</th></tr>
<tr><td>Degree of adhesion</td><td>Must come under either Type special or Type 1</td><td>Ditto</td></tr>
<tr><td>Moisture content</td><td>Must pass the moisture content test as prescribed in Supplementary provisions 3 - (3)</td><td>Ditto</td></tr>
<tr><td>Bending strength and Young's modulus</td><td>Must pass the bending test for Class 1 as prescribed in Supplementary provisions 3 - (4)</td><td>Must pass the bending test for Class 2 as prescribed in Supplementary provisions 3 - (4)</td></tr>
<tr><td>Compression strength</td><td>Must pass the compression test for Class 1 as prescribed in Supplementary provisions 3 - (5)</td><td></td></tr>
<tr><td>Quality of face and back</td><td>The grades given in the following Table must conform to their respective quality standards for layer surfaces as specified in the following paragraph:
<table>
<tr><th rowspan="2">Grade</th><th colspan="2">Quality</th></tr>
<tr><th>Face</th><th>Back</th></tr>
<tr><td>A - 1</td><td>a</td><td>b</td></tr>
<tr><td>A - 2</td><td>b</td><td>b</td></tr>
<tr><td>B - 1</td><td>a</td><td>c</td></tr>
<tr><td>B - 2</td><td>b</td><td>c</td></tr>
<tr><td>B - 3</td><td>c</td><td>c</td></tr>
<tr><td>C - 1</td><td>a</td><td>d</td></tr>
<tr><td>C - 2</td><td>b</td><td>d</td></tr>
<tr><td>C - 3</td><td>c</td><td>d</td></tr>
</table>
</td><td>The grades given in the following Table must conform to their respective quality standards for layer surfaces as specified in the following paragraph:
<table>
<tr><th rowspan="2">Grade</th><th colspan="2">Quality</th></tr>
<tr><th>Face</th><th>Back</th></tr>
<tr><td>A - B</td><td>a</td><td>b</td></tr>
<tr><td>A - C</td><td>a</td><td>c</td></tr>
<tr><td>A - D</td><td>a</td><td>d</td></tr>
<tr><td>B - B</td><td>b</td><td>b</td></tr>
<tr><td>B - C</td><td>b</td><td>c</td></tr>
<tr><td>B - D</td><td>b</td><td>d</td></tr>
<tr><td>C - C</td><td>c</td><td>c</td></tr>
<tr><td>C - D</td><td>c</td><td>d</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td>Quality of core or cross band</td><td>Shall be conformed to the requirements for core and cross band for Class 1 as specified under paragraph 3.</td><td>Shall be conformed to the requirements for core and cross band for Class 2 as specified under paragraph 3.</td></tr>
<tr><td>Materials</td><td></td><td>Materials of face, back, core and cross band shall be those of Engelmann spruce (Picea engelmannii Parry.) or better in strength.</td></tr>
<tr><td>Composition of veneers</td><td>The number of plies, thickness and composition of veneers must conform to the standards as specified in the following Table. In this case, the core or cross band made of veneers glued over each other in parallel grain directions should be regarded as one
(Unit: mm)
<table>
<tr><th>Thickness of panel</th><th>No. of plies</th><th>Thickness of veneers and composition</th></tr>
<tr><td>5.0</td><td>3</td><td>1.5-2.0-1.5</td></tr>
<tr><td>6.0</td><td>3</td><td>1.5-3.0-1.5</td></tr>
<tr><td>7.5</td><td>5</td><td>1.5-1.5-1.5-1.5-1.5</td></tr>
<tr><td>9.0</td><td>5</td><td>1.5-2.25-1.5-2.25-1.5</td></tr>
<tr><td>12.0</td><td>5</td><td>1.5-3.0-3.0-3.0-1.5</td></tr>
<tr><td>15.0</td><td>7</td><td>1.5-3.0-1.5-3.0-1.5-3.0-1.5</td></tr>
<tr><td>18.0</td><td>7</td><td>1.5-3.0-3.0-3.0-3.0-3.0-1.5</td></tr>
<tr><td>21.0</td><td>7</td><td>2.25-3.5-3.0-3.5-3.0-3.5-2.25</td></tr>
<tr><td>24.0</td><td>9</td><td>2.4-3.0-2.4-3.0-2.4-3.0-2.4-3.0-2.4</td></tr>
</table></td><td>The number of plies, thickness and composition of veneers must conform to the standards as specified in the following Table
(Unit: mm)
<table>
<tr><th>Thickness of panel</th><th>No. of plies</th><th>Thickness of veneers</th><th>Composition</th></tr>
<tr><td>Less than 15.0</td><td>3 or more</td><td rowspan="2">1.5 or more</td><td rowspan="4">Total thickness of veneers parallel to the face veneer shall be not less than 40% and not more than 70% of panel thickness</td></tr>
<tr><td>Not less than 15.0, less than 18.0</td><td>4 or more</td></tr>
<tr><td>Not less than 18.0, less than 24.0</td><td>5 or more</td><td rowspan="2">5.5 or less</td></tr>
<tr><td>24.0 or more</td><td>7 or more</td></tr>
</table></td></tr>
<tr><td>Warping or testing</td><td>Shall not severely injure the serviceability of the panel</td><td>Ditto</td></tr>
</table>

<table>
<tr>
<td>Dimensions</td>
<td>
1. The standard width and length shall be as specified below:
(Unit: mm)
<table>
<tr><th>Width</th><th>Length</th></tr>
<tr><td>910</td><td>1,820</td></tr>
<tr><td>910</td><td>2,130</td></tr>
<tr><td>910</td><td>2,440</td></tr>
<tr><td>910</td><td>2,730</td></tr>
<tr><td>955</td><td>1,820</td></tr>
<tr><td>1,000</td><td>2,000</td></tr>
<tr><td>1,220</td><td>2,440</td></tr>
<tr><td>1,220</td><td>2,730</td></tr>
</table>
2. The specified thickness shall be as follows:
(Unit: mm)
5.0, 6.0, 7.5, 9.0, 12.0, 15.0, 18.0, 21.0, 24.0
3. The discrepancies between the marked and measured dimensions for the items given in the left column of the following Table shall be as specified in the right column respectively:
(Unit: mm)
<table>
<tr><th colspan="2">Marked dimension</th><th colspan="2">Discrepancy from measured dimension</th></tr>
<tr><td rowspan="9">Thickness</td><td>5.0</td><td>+0.3</td><td>-0</td></tr>
<tr><td>6.0</td><td>+0.3</td><td>-0</td></tr>
<tr><td>7.5</td><td>+0.4</td><td>-0</td></tr>
<tr><td>9.0</td><td>+0.5</td><td>-0</td></tr>
<tr><td>12.0</td><td>+0.6</td><td>-0</td></tr>
<tr><td>15.0</td><td>+0.8</td><td>-0</td></tr>
<tr><td>18.0</td><td>+0.9</td><td>-0</td></tr>
<tr><td>21.0</td><td>+1.1</td><td>-0</td></tr>
<tr><td>24.0</td><td>+1.2</td><td>-0</td></tr>
<tr><td colspan="2">Width and length</td><td>+0</td><td>-3</td></tr>
</table>
4. Diagonals shall not be differed by more than 3mm in length
</td>
<td>
1. The standard width and length shall be as specified below:
(Unit: mm)
<table>
<tr><th>Width</th><th>Length</th></tr>
<tr><td>900</td><td>1,800</td></tr>
<tr><td>900</td><td>1,818</td></tr>
<tr><td>910</td><td>1,820</td></tr>
<tr><td>910</td><td>2,130</td></tr>
<tr><td>910</td><td>2,440</td></tr>
<tr><td>910</td><td>2,730</td></tr>
<tr><td>955</td><td>1,820</td></tr>
<tr><td>1,000</td><td>2,000</td></tr>
<tr><td>1,220</td><td>2,440</td></tr>
<tr><td>1,220</td><td>2,730</td></tr>
</table>
2. The recommended standard thickness shall be as follows:
(Unit: mm)
5.0, 6.0, 7.5, 9.0, 12.0, 15.0, 18.0, 21.0, 24.0
3. The discrepancies between the marked and measured dimensions for the items given in the left column of the following Table shall be as specified in the right column respectively:
(Unit: mm)
<table>
<tr><th colspan="2">Marked dimension</th><th colspan="2">Discrepancy from measured dimension</th></tr>
<tr><td rowspan="2">Thickness</td><td>7.5 or less</td><td>+0.5</td><td>-0.3</td></tr>
<tr><td>More than 7.5</td><td>+0.8</td><td>-0.5</td></tr>
<tr><td colspan="2">Width and length</td><td>+0</td><td>-0.3</td></tr>
</table>
4. Diagonals shall not be differed by more than 3mm in length
</td>
</tr>
</table>

Marking	Marking	The following matters shall be marked in one block: (1) Name of product (2) Dimensions (3) Name or company name of the manufacturer or distributor	Ditto
	Method of marking	1. The matters for marking (1) and (2) shall be given in the following ways: (1) Name of product Mark as "Structural Plywood" (2) Dimensions Mark the thickness, width and length of the panel specifying they are in milimeter, centimeter, or meter 2. The matters specified for marking shall be given at proper position of each panel or package	Ditto
	Prohibited marking	The following matters shall not be marked: (1) Any term that contradicts the markings as required above (2) Any wording or other indication that tends to cause misunderstanding of the quality of the product	Ditto

2. The standards for the quality of veneers as prescribed in the preceding paragraph shall be as follows:

Items	Standards			
	a	b	c	d
Total of the widthwise dimension of sound knot, dead knot, loose knot, knot hole, open split, chip, joint gap, cross check, linear worm hole and patch	Not more than 1/20 of panel width	Not more than 1/15 of panel width	Not more than 1/10 of panel width (In case of Class 2, not more than 1/5 of panel width, but if thickness of face and back of the panel is not less than the thickness given in Appendix Table, up to 1/2 of panel width will be permitted	Not more than 1/7 of panel width (In case of Class 2, not more than 1/5 of panel width, but if the maximum widthwise diameter of sound knot, dead knot, loose knot or knot hole is less than 65mm, and the thickness of face and back of the panel is not less than the thickness given in Appendix Table, up to 1/2 of panel width will be permitted

Sound knot or dead knot	Not more than 25mm in diameter along the width of the panel	Not more than 40mm in diameter along the width of the panel	Not more than 50mm in diameter along the width of the panel	Not more than 75mm in diameter along the width of the panel
Loose knot or knot hole	Not more than 3mm in diameter along the width of the panel	Not more than 5mm in diameter along the width of the panel	Not more than 40mm in diameter along the width of the panel	Not more than 75mm in diameter along the width of the panel
Patch	Not more than 50mm in diameter along the width of the panel	Not more than 100mm in diameter along the width of the panel	Ditto	Ditto
Bark pocket or resin pocket	Not more than 30mm in long span	Not conspicuous	Not severely injure the serviceability of the panel	Ditto
Burl or vine streak	Slight	Not conspicuous	Not severely injure the serviceability of the panel	Ditto
Decay	Not permitted	Ditto	Ditto	Ditto
Open split (including chip or joint gap)	Not more than 20% of panel length in length, not more than 1.5 mm in width and not more than 2 in number	Not more than 40% of panel length in length, not more than 6mm in width and not more than 3 in number; or not more than 20% of panel length in length, not more than 6 in number	1. Split on panel shall not exceed 6mm in width which located within 25mm of parallel panel edge 2. In case of split which located other than the area written above, (1) the length of split which does not exceed 10mm in width at a point 200mm from the end of the panel shall not be limited, provided that end of the split is tapered, or the length of split which does	1. Split on panel shall not exceed 6mm in width which located within 25mm of parallel panel edge 2. In case of split which located other than the area written above, (1) Split on panel shall not exceed 25mm in width at a point 200mm from the end of the panel and the end of split shall be tapered (2) Split on panel shall not exceed 75mm in width when

			not exceed 15mm in width at a point 200mm from the end of the panel shall not exceed 50% of the panel length (2) Split on panel shall not exceed 50mm in width when located within 200mm from the end of the panel	located within 200mm from the end of the panel
Cross check	Not permitted	Ditto	Very slight	Ditto
Worm hole	1. In case of round bores, not more than 1.5mm in long span and not gathered 2. In case of linear bores, not more than 10mm in long span and not more than 4 times the number of the panel are in square meter (rounding up any fraction to the unit) in number	Not conspicuous	Not severely injure the serviceability of the panel	Ditto
Other defects	Slight	Not conspicuous	Ditto	Ditto

(Note) "Total of the widthwise dimension of sound knot, dead knot, loose knot, knot hole, open split, chip, joint gap, cross check, linear worm hole and patch" is obtained by adding up all the diameter widthwise, width or length of these defects in the panel portion of 300mm wide at right angle to its length where these defects are most numerous.

3. The standards for the core and cross band as prescribed in the preceding paragraph shall be as follows:

Item	Standard	
	Class 1	Class 2
Total of the widthwise dimension of sound knot, dead knot, loose knot, knot hole, open split, chip, joint gap, cross check, linear worm hole and patch	Not more than 1/5 of the panel width	
Sound knot	Not more than 75mm in the widthwise diameter	
Dead knot, loose knot or knot hole	Not more than 75mm in the widthwise diameter	Not more than 75mm in the widthwise diameter. In case of veneer at least 2 plies removed from face or back, not more than 90mm in the widthwise diameter
Bark pocket or resin pocket	Not severely injure the serviceability of the panel	Ditto
Burl or vine streak	Not severely injure the serviceability of the panel	Ditto
Decay	Not permitted	Ditto
Open split (including chip or joint gap)	1. Shall not exceed 6mm in width when located within 25mm from parallel panel edge 2. In case of split which located other than the area written in the above item 1, (1) The width shall not exceed 25mm at a point 200mm from the end of the panel and the end of the split shall be tapered (2) The width shall not exceed 75mm at a point 200mm from the end of the panel	Ditto

Cross check	Very slight	Ditto
Worm hole	Not severely injure the serviceability of the panel	Ditto
Other defects	Not conspicuous	Ditto

(Note) Same as the "Note" for the preceding paragraph.

Supplementary Provisions

1. Sampling of Test Pieces

The panels from which the test specimens should be cut off (hereafter called "Sample panels") for the continuous boiling test, cyclic boiling test, moisture content test, bending test and compression test shall be taken at random in numbers specified in the right column of the following Table according to the size of the lot as given in the left column:

No. of panels of a lot	No. of sample panels	
1,000 or less	4 or less	In case of retesting these number should be doubled
1,001 - 2,000	6	
2,001 - 3,000	8	
3,001 or more	10	

2. Judgement of Test Results

Of the test pieces collected from each sample panel as specified in the preceding Article, the panels of lot concerned shall be judged to have passed the particular test when 90% or more of the test specimens from the lot conform to the standards for the test, but they shall be judged to have failed in the test when the percentage is less than 70%. In case the percentage is more than 70% but less than 90%, a retest procedure shall be carried out with the number of sample panel specified for re-testing. In this case, if the percentage is 90% or more, the panels of the lot concerned shall be judged to have passed the particular test, but if it is less than 90%, they shall be judged to have failed in the test.

3. Methods of Testing

(1) Continuous Boiling Test

a) Preparation of test specimen

The test specimen shall be prepared out of sample panel as follows:

(a) As for the 3-ply plywood, 4 test specimens of the shape as indicated in Fig. (1) shall be made out of each sample panel (Type A in case of the plywood with face veneer measuring more than 1.6mm in thickness, and Type B in case of the plywood with its face veneer measuring 1.6mm or less in thickness or of the plywood whose failures occur in face veneer when Type A specimens be used). In this case, the kerfing shall be cut in such way that an equal number of test specimens out of each sample panel have the lathe check of core veneer in the closed or open direction with that of the load.

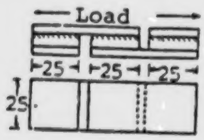
(b) As for the 5-ply, 7-ply and 9-ply plywood, they shall be made into 3-ply by stripping off veneers in such way that all the glued joints of the original sample panel are included in the test specimens. The test specimens shall be prepared by above (a).

Fig. (1)

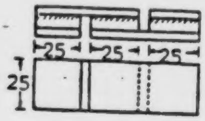
(Unit: mm)

Type A

Directions of lathe check of core veneer and load are same (closed type)

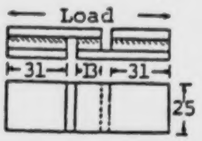


Directions of lathe check of core veneer and load are reverse (open type)

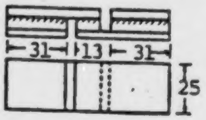


Type B

Directions of lathe check of core veneer and load are same (closed type)



Directions of lathe check of core veneer and load are reverse (open type)



(Note) In case of softwood veneer is included in the composition of plywood, kerfing shall be extended two-thirds of the core ply.

b) Test procedure

Test specimens shall be submerged in boiling water for 72 hours, then cooled off in water at room temperature. Adhesive strength test shall be carried out while wet (by gripping both ends of the specimen, tensile loading at a rate of not greater than 600 kg/minute shall be applied to failure occurs, and measure the maximum breaking load; hereafter the same) to obtain the shear strength and average wood failure. In case of composed by hardwood species exclusively, measure the shear strength only.

(Note) The shear strength is calculated by the following formula. In case the thickness ratio of core to face is 1.5 or more, multiply the factors obtained by the right column of the following Table by the core/face thickness ratio.

$$\text{Shear strength (kg/cm}^2\text{)} = \frac{Ps}{b \times h}$$

where,

Ps = Maximum load (kg)

b = Width of test specimen (cm)

h = Length between kerfing (cm)

Core/face thickness ratio	Factor
1.50 or more and less than 2.00	1.1
2.00 or more and less than 2.50	1.2
2.50 or more and less than 3.00	1.3
3.00 or more and less than 3.50	1.4
3.50 or more and less than 4.00	1.5
4.00 or more and less than 4.50	1.7
4.50 or more	2.0

c) Requirement for passing of specimen

Shear strength and average wood failure (%) shall be equal to or greater than the following standard values:

Wood species used in test specimen		Average wood failure (%)	Shear strength (kg/cm²)
Hard-woods	"Kaba"		10
	"Buna", "Nara", "Itayakaede", "Akadamo", "Shioji", "Yachidamo"		9
	"Sen", "Hoo", "Katsura", "Tabu"		8
	"Lauan", "Shina", and other hardwood species		7
Softwoods			7
		50	6
		65	5
		80	4

(Note) In case of a test specimen made up of a combination of veneers of different species, the lowest standard value of shear strength of species involved shall be applied.

(2) Cyclic Boiling Test

a) Preparation of test specimen

The provisions of (1) - a) shall be applied mutatis mutandis.

b) Test procedure

Test specimens shall be submerged in boiling water for 4 hours, and then dried at a temperature of 60 ±3°C for 20 hours, again submerged in boiling water for 4 hours, and then cooled off in water at room temperature. Shear strength test with the specimens while wet to obtain shear strength and average wood failure.

c) Requirement for passing of specimen

The provisions of (1) - c) shall be applied mutatis mutandis.

(3) Moisture Content Test

a) Preparation of test specimen

Prepare two test specimens of an appropriate size out of each sample panel.

b) Test procedure

Determine the percentage moisture content by bone dry weight method. Some other methods than bone dry weight method may be applied in case such methods can clearly determine whether the specimen meets the required standards or not.

(Note) The bone dry weight is the weight at the time when the test specimen, being dried in a drier at a temperature between 100°C to 105°C, is recognized to have reached to a constant weight; the moisture content (%) is to be calculated by the following formula:

$$\text{Moisture content } (\%) = \frac{W_1 - W_2}{W_2} \times 100$$

where,

W_1 = Weight before drying (g)

W_2 = Bone dry weight (g)

c) Requirement for passing of specimen

The average moisture content of the test specimens prepared from the same sample panel shall be not more than 14%.

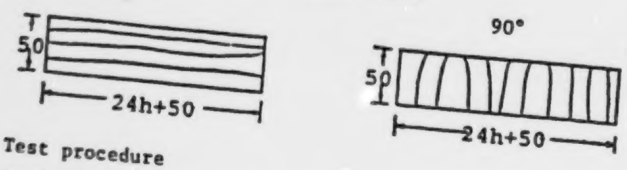
(4) Bending Test

a. Class 1.

a) Preparation of test specimen

Prepare out of each sample panel two each of two different rectangular test specimens. As indicated in Fig. (2), one should be 50mm in width at right angle with the main grain direction of face veneer, by 24 times of the plywood thickness plus 50mm in length in parallel with the main grain direction; the other should be 50mm in width in parallel with the main grain direction of face veneer, by 24 times of the plywood thickness plus 50mm in length at right angle to the main grain direction of face veneer.

Fig. (2)



(Unit: mm)

b) Test procedure

As indicated in Fig. (3), carry out the test with the test specimens, placing the main grain direction of face veneer either in parallel or at right angle with the span direction. Measure the upper and lower limit loads within the proportionality range, corresponding strain and maximum load, and work out the bending strength and Young's modulus. The average loading rate applied should be not more than 150 kg/cm² per minute.

(Note) The bending strength and Young's modulus are to be calculated by the following formulae:

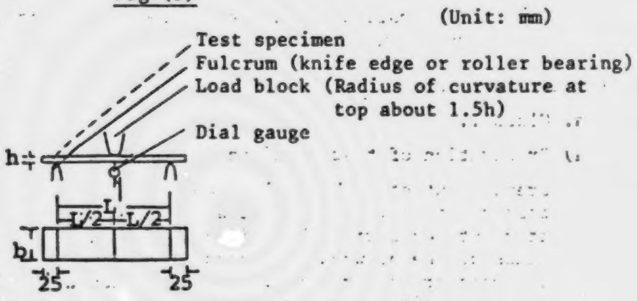
$$\text{Bending strength } (\text{kg/cm}^2) = \frac{3P_b l}{2\,b\,h^2}$$

$$\text{Young's modulus } (\text{kg/cm}^2) = \frac{\Delta p\ l^3}{4\,b\,h^3\,y}$$

where,

P_b = Maximum load (kg)
l = Length of span (cm)
b = Width of test specimen (cm)
h = Thickness of test specimen (cm)
p = Difference between upper and lower limit loads within proportionality range (kg)
y = Strain at mid-span corresponding to Δ p (cm)

Fig (3)


(Unit: mm)
Test specimen
Fulcrum (knife edge or roller bearing)
Load block (Radius of curvature at top about 1.5h)
Dial gauge
h
L
L/2
L/2
b
25
25

L : Length of span
h : Thickness of test specimen
b : Width of test specimen

c) Requirement for passing of specimen

The bending strength and Young's modulus shall be not less than the values given in the following Table:

Thickness (mm)	Bending strength (kg/cm²)						Young's modulus (10^3 kg/cm²)	
	0°			90°				
	A	B	C	A	B	C	0°	90°
5.0	420	380	340	80	80	80	85	5
6.0	380	360	320	140	140	140	80	10
7.5	340	320	280	120	120	120	70	20
9.0	320	280	260	160	160	160	65	25
12.0	260	240	220	200	200	200	55	35
15.0	240	220	200	200	200	200	50	40
18.0	240	220	200	200	200	200	50	40
21.0	260	240	220	180	180	180	55	35
24.0	260	240	220	180	180	180	55	35

(Note) "0°" and "90°" of the table mean the angle of span direction to the main grain direction of face veneer of the specimen, prescribed in Supplementary Provisions 3 - (4) - b). "A", "B" and "C" refer to those standards of Article 3 that are largely concerned with strength.

b. Class 2.

a) Test procedure

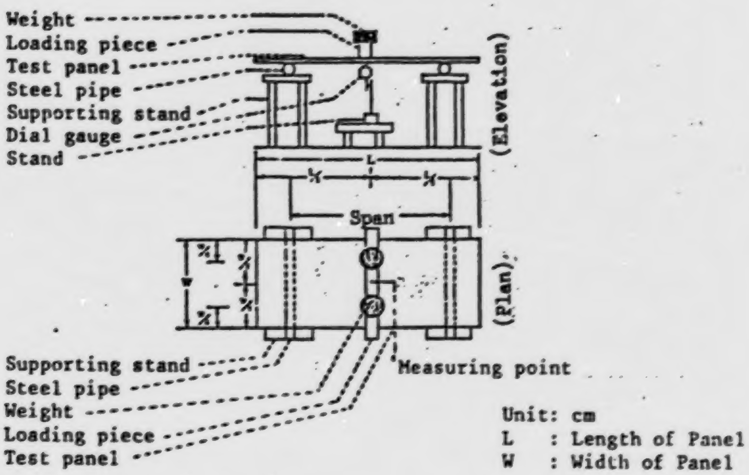
As indicated in Fig. (4), full-size test panel should be placed with face upside on the effective length (width of the panel) of loading piece, which is placed in the middle of span at a right angle to the face grain. Appropriate load should be applied according to the thickness, width and length of the panel. Young's modulus should be calculated by measuring the strain.

(Note) Young's modulus is to be calculated by the following formula:

$$\text{Young's modulus in bending (kg/cm}^2\text{)} = \frac{\Delta P\ l^3}{4\ b\ h^3\ \ y}$$

Where,
l = Length of span (cm)
b = Width of test panel (cm)
h = Thickness of test panel (cm)
ΔP = Difference between upper and lower limit loads within proportionality range (kg)
Δy = Strain at mid-span corresponding to ΔP (cm)

Fig. (4)


Weight
Loading piece
Test panel
Steel pipe
Supporting stand
Dial gauge
Stand
(Elevation)
L
Span
W
(Plan)
Supporting stand
Steel pipe
Weight
Loading piece
Test panel
Measuring point
Unit: cm
L : Length of Panel
W : Width of Panel

b) Requirement for passing of specimen

Young's modulus in bending should not be less than the values listed in the following Table:

Thickness (mm)	Young's modulus in bending (10^3 kg/cm^2)
5.0	65
6.0	60
7.5	55
9.0	50
12.0, 15.0, 18.0, 21.0, 24.0	40

(Note) As for the specimens of which thickness are between the figures of thickness listed above, Young's modulus in bending should be not less than the values calculated in proportion of thickness.

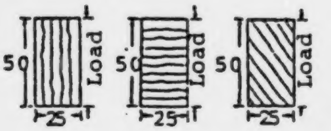
(5) Compression Test

a) Preparation of test specimen

Prepare out of each sample panel two each of three different rectangular test specimens. As indicated in Fig. (5), one should be 50mm in parallel by 25mm at right angle to the main grain direction of face veneer, the other should be 50mm at right angle by 25mm in parallel to the main grain direction of face veneer; and the third should be 50mm for one side at 45° to the main grain direction of face veneer by 25mm for the other side. In case of sample panels of 5.0mm, 6.0mm and 7.5mm in thickness, however, four each of these test specimens should be prepared, and two pieces having the same main direction be glued over each other.

Fig. (5)

(Unit: mm)



b) Test procedure

As indicated in Fig. (5), carry out the test with the test specimens for the three cases of load direction either in parallel, at right angle or at 45° with the main grain direction of face veneer of the test specimen and measure the maximum load and compression strength. The average loading rate applied should be not more than 100 kg/cm² per minute.

(Note) The compression strength is to be worked out by the following formula;

$$\text{Compression strength (kg/cm}^2\text{)} = \frac{P_c}{A}$$

Where,

P_c = Maximum load (kg)

A = Area of cross section of test specimen (cm²)

c) Requirement for passing of specimen

The compression strength of specimen shall not be less than the values given in the following Table:

(kg/cm²)

Thickness (mm)	0°			90°			45°
	A	B	C	A	B	C	
5.0	160	140	140	90	90	90	80
6.0	140	120	120	120	120	120	80
7.5	140	140	120	90	90	90	80
9.0	120	120	110	120	120	120	80
12.0	120	120	110	120	120	120	80
15.0	110	90	90	140	140	140	80
18.0	120	120	110	120	120	120	80
21.0	120	120	110	120	120	120	80
24.0	120	120	110	120	120	120	80

(Note) "0°", "90°" and "45°" given in the above Table show the angles of the main grain direction of face veneer of the specimen to the load direction as defined in Supplementary Provisions 3 - (5) - b). "A", "B" and "C" refer to those standards of Article 3 which are largely concerned with strength.

Appendix Table (Concerning Article 3 - 2, standards for veneers c and d)

(Unit: mm)

Thickness of panel	Thickness of face and back veneer			
	3 or 4-ply	5 or 6 ply	7 or 8-ply	9-ply or more
7.5 or more and less than 9.0	2.5	-	-	-
9.0 or more and less than 12.0	2.5	-	-	-
12.0 or more and less than 15.0	2.5	2.0	-	-
15.0 or more and less than 18.0	3.0	2.5	-	-
18.0 or more and less than 21.0	-	3.0	-	-
21.0 or more and less than 24.0	-	4.0	3.0	-
24.0 or more	-	-	3.5	3.0

Additional Provision

1. This notification is become effective on January 14th of 1983.

APPENDIX D:

JAS TEST METHOD FOR PLYWOOD

APPENDIX D

A-12

JAS

The Test Method
For The Evaporated Amount Of Formaldehyde In The Japanese Agricultural Standard For Ordinary Plywood, Plywood For Special Use, And Flooring Plywood

August, 1982

1. Sampling of Test Pieces

The panels (hereafter called "sample panels") from which the test specimens (hereafter called "specimens") are to be cut off shall be sampled at random in numbers as specified in the right-hand column of the following Table according to the size of the lot as given in the left-hand column. Then the specimen shall be cut off, to a size appropriate for the test, from the sample panels.

Number of plywoods in a lot	Number of sample panels	
1,000 or less	2 or less	In case of retesting for an item other than the formaldehyde evaporation, double these numbers
1,001 - 2,000	3	
2,001 - 3,000	4	
more than 3,001	5	

2. Test for the Evaporated Amount of Formaldehyde

a. Collection of Formaldehyde

As shown in Fig. 1, a crystallizing dish of 120 mm in diameter and 60 mm in height containing 300 ml of distilled water is placed at the bottom of a 240-ml (inner volume: 9-11 liters) desiccator which is specified in JIS R3503 (Glasswares for Chemical Analysis). Several specimens, being kept apart from each other by means of a pair of metallic holders, are placed on this crystallizing dish as shown in Fig. 2 and, after standing for 24 h at 20 °C, the distilled water, having absorbed formaldehyde evaporated from the specimen, is used as a sample solution.

Fig. 1

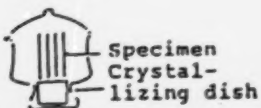
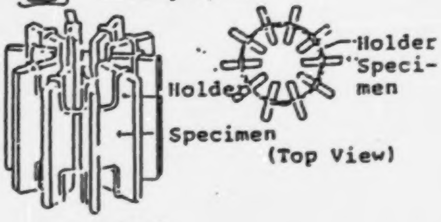


Fig.2



(Overview)

b. Determination of Formaldehyde Concentration

The formaldehyde concentration of the sample solution is determined by the acetylacetone method by means of colorimetry with a spectrophotometer or a photoelectric colorimeter.

(i) Acetylacetone-ammonium acetate solution

150 g of ammonium acetate is dissolved in 800 ml of distilled water, into which 3 ml of glacial acetic acid and 2 ml of acetylacetone are added. After thorough mixing the solution is made up to 1 liter with distilled water and is put in a brown-colored bottle. All the chemicals should be of reagent grade.

(ii) Measurement procedure

25 ml of the test solution is put in a 100-ml conical flask with a co-ground stopper, into which 25 ml of acetylacetone-ammonium acetate solution is added and the mixture is shaken thoroughly. The conical flask provided with a stopper is heated for 10 min in a hot water bath at 60 - 65 °C, thus giving the test solution.

In a parallel procedure a reference solution is prepared by using distilled water instead of the sample solution.

After cooling down to room temperature, the test solution and the reference solution are put in optical cells. First the spectrophotometer is adjusted to zero absorbance with the reference solution at a maximum wavelength around 415 nm, then the absorbance of the test solution is measured. The formaldehyde concentration is calculated from the calibration curve which had been established beforehand.

(NOTE) Establishment of the Calibration Curve

1. A standard stock solution is prepared by diluting 1 ml of formalin solution (37 % in formaldehyde) to 1 liter with distilled water, and is examined as follows:

5 ml of the standard stock solution is put in a 50 - 100 ml conical flask with a co-ground stopper, into which are added 20 ml of 0.01 N iodine solution and 1 ml of 5 N potassium

hydroxide solution. The flask is stopped and left standing for 15 min at ordinary temperature.

In a parallel procedure a blank solution is prepared with 5 ml of distilled water instead of the standard stock solution.

2 ml of 5 N sulfuric acid is added gradually to the solution in the conical flask, which is then stopped again and left standing for 5 min at ordinary temperature, and the final solution is titrated with a 0.01 N sodium thiosulfate solution. The amount of formaldehyde in 1 ml of the standard stock solution is calculated by the following equation:

$$\text{Amount of formaldehyde (mg/ml)} = \frac{0.1501 \times (B-S) \times F}{5}$$

B: Titration volume (ml) for the blank solution
S: Titration volume (ml) for the formaldehyde standard stock solution
F: Factor of the sodium thiosulfate solution

The 0.01 N sodium thiosulfate solution is prepared and standardized according to Item 2.(34) of the JIS K8006 (Fundamentals for Titration Procedure in Tests of Chemical Contents), and is used after an exactly 10-fold dilution with distilled water.

2. A prescribed amount of the standard stock solution, examined as in 1. above, is put in a volumetric flask. A standard solution is prepared by diluting this solution with distilled water so as to give the formaldehyde concentration of 0.1 mg per ml.

3. 0.5 ml, 1.0 ml and 1.5 ml of the standard solution are sampled and diluted to 25 ml with distilled water, to give formaldehyde solutions at concentrations of 2 mg/l, 4 mg/l and 6 mg/l, respectively. 25 ml of freshly prepared acetylacetone-ammonium acetate solution is added to each solution and, after heating the solutions for 10 min in a hot water bath at 60 - 65 °C and then cooling down to room temperature, the absorbance of each

solution is measured.

4. The absorbances thus measured are plotted on a graph paper against the formaldehyde concentration to obtain the calibration curve.

Judgment of Test Results

1. In cases of cyclic boiling test, immersion test in hot and cold water, normal adhesivity test, class 1 immersion-peeling off test, class 2 immersion-peeling off test, class 3 immersion-peeling off test, and moisture content test, the panels of the lot concerned shall be judged to have passed the particular test if more than 90 % of the test pieces (sample panels for the moisture content test) sampled from a lot for each test according to Appendix I conform to the standards for the test concerned, but they shall be judged to have failed in the test if the percentage is less than 70 %. In case the percentage falls between 70 and 90 %, a re-test shall be carried out with the number of sample panels specified for re-testing. In this case, if the percentage is 90 % or more, the plywoods of the lot concerned shall be judged to have passed the particular test, while if it is less than 90 %, they ahall be judged to have failed the test.

2. In the case of the test for the evaporated amount of formaldehyde, the panels of the lot concerned shall be judged to have passed the test if the mean and maximum values of the evaporated amount of formaldehyde from the sample panels collected according to Appendix I conform, for each classification specified in the following Table, to the mean and maximum values given in the Table. Otherwise the panels of the lot concerned shall be judged to have failed the test.

Classification of Labelling	Mean Value	Maximum Value
Labelled as F1	Not more than 0.5 mg/l	Not more than 0.7 mg/l
Labelled as F2	Not more than 5 mg/l	Not more than 7 mg/l
Labelled as F3	Not more than 10 mg/l	Not more than 12 mg/l

APPENDIX E:

JAS COMMON PLYWOOD AND COMMENTARY

APPENDIX E

4-11

JAPANESE AGRICULTURAL STANDARD
OF
COMMON PLYWOOD AND ITS COMMENTARY

Appendix: Forms and marking methods for
standard Certificates of common plywood

The Japan Plywood Inspection Corporation
The Japan Plywood Manufacturers' Association

CONTENTS

History for Japanese Agricultural Standard of Common Plywood

Outline for Japanese Agricultural Standard of Common Plywood

I. STANDARD AND COMMENTARY

Page

(I) Applicable Scope 12

(II) Definitions 13

(III) Standard for Common Plywood containing a Veneer Sheet of Domestic Species as a Top Surface Sheet 17

- (a) Quality for top surface sheet 20
- (b) Quality for back surface sheet 36

(IV) Standard for Common Plywood containing a Veneer Sheet of Species except Domestic Species as a Top Surface Sheet 37

- (a) Quality for top surface sheet 38
  - * Plywood having less than 3 mm of thickness for the use of temporary construction material or sheathing material
  - * Plywood for the use of blank board
- (b) Quality for back surface sheet 56

(V) Common Plywood, not admitted in the Specifications of Article 3 and Article 4 57

(VI) Standard Sizes 58

Page

(VII) Testing Method and Judgement 60

(1) Testing Method 60

(a) Collection of testing method sample 60

(b) Preparation of test pieces 60

(c) Testing method 62

(2) Judgement for testing results 65

II. FORMS AND MARKING METHODS FOR STANDARD CERTIFICATES OF COMMON PLYWOOD AND ITS COMMENTARY 75

(1) Forms 75

(2) Marking Methods 76

List for Location of Japan Plywood Inspection Corporation, Headquarters, District Offices and Detachments 83

HISTORY AND SUMMARY FOR
JAPANESE AGRICULTURAL
STANDARD OF COMMON PLYWOOD

HISTORY FOR JAPANESE AGRICULTURAL STANDARD OF COMMON PLYWOOD

Institution: On the basis of Agriculture and Forestry Standard Law (Law #175, 1950) in accordance with Ministry of Agriculture and Forestry, Notification #518, 1 August 1953, the specification for the domestic use plywood was promulgated.

Abolition: Above specification of the domestic use plywood was abolished in accordance with Ministry of Agriculture and Forestry, Notification #960, 27 November 1958.

Institution: The institution was based on the same Notification #960, 27 November 1958, Ministry of Agriculture and Forestry.

The entire alteration was carried out to make a content of the specification to conform to the practical situation. For the sake of the procedure, the forms of abolition and institution were adopted.

Partial Amendment: In compliance with enactment of Ministry of Agriculture and Forestry, Notification #13, 14 January 1960, a standard for combustion resistance type of common plywood was auxiliary stipulated.

Partial Amendment: The partial amendment was carried out on the basis of Ministry of Agriculture and Forestry, Notification #29, 16 January 1961.

In compliance with institution of Japan Agricultural Standard for plywood of fire resistant door use, an applicable scope was changed and stipulated.

Partial Amendment: On the basis of enactment of Ministry of Agriculture and Forestry, Notification #623, 15 June 1961, Japan Agricultural Standard for combustion resistance type of plywood was stipulated. Above combustion resistance type of plywood involves a common plywood, a fancy veneered plywood and a surface processed plywood which are treated with a combustion resistance treatment, as its objective plywood. In compliance with alteration for stipulation of the applicable scope, the stipulation for the combustion resistance type of plywood was deleted.

Partial Amendment: On the basis of enactment of Ministry of Agriculture and Forestry, Notification #1031, 29 September 1961, Japanese Agricultural Standard for specialty plywood was enacted and the stipulations for its applicable scope was changed.

Abolition: On the basis of enactment of Ministry of Agriculture and Forestry, Notification #383, 11 April 1964, above Japanese Agricultural Standard was abolished.

Institution: On the basis of the same Notification #383, 11 April 1964, the entire alteration was enacted to make a content of the specification to comply with the practical situation and for the sake of the procedure convenience, the forms of abolition and institution were adopted. Particularly, the present amendment involves enactments on the entire amendments to names of specifications, constitutions of specifications, the applicable scopes, and grading classification, in the other words, fundamental points of the specifications.

Partial Amendment: On the basis of enactment of attendant regulation, Ministry of Agriculture and Forestry, Notification #932, 30 June 1967, Japanese Agriculture and Forestry Standard for plywood of concrete form use was enacted and thereby stipulations for applicable scopes and definitions were changed.

OUTLINES FOR JAPANESE AGRICULTURAL STANDARD OF COMMON PLYWOOD

Japanese Agricultural Standard of common plywood for lauan plywood as well as plywood of domestic species consists of six items which involve these adhesiveness, moisture content, quality of surface veneer, quality of core sheet, finishing degree of lateral surface, and tolerances of sizes. Generally, a common plywood, if its qualities are admitted in the specification of above six items, can be regarded as a satisfactory grade of plywood. However, strength, particularly bending strength and impact strength, and combustion resistance nature and weather resistance, in addition to above six items may be necessarily emphasized by the use of plywood. In major case, above requirements are rather emphasized. Out of above requirements, the combustion resistance nature is stipulated in the specification of combustion resistance type of plywood, Japan Agricultural Standard. But in respect to strength and weather resistance, presumably, the specifications will be gradually stipulated in the future.

1. Adhesiveness

Adhesiveness is regarded as a vital point of plywood. It is difficult for even if a specialist to discriminate by its appearance what kind of adhesiveness is used in the plywood. Consequently, for the convenience of consumers, plywood dealers classify the kinds of adhesiveness into the following three types by taking in consideration these grades. As a principle, it is manifestly marked what kind of adhesiveness is employed in each plywood. For a plywood which is difficult to mark the kind of adhesiveness, the marking of this meaning is given a package containing above plywood.

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Marking	Kinds of adhesiveness	Quality	Testing method	Employable purpose
Type 1	Perfect water resistance	Phenol resin or the same or more superior quality of adhesive agent shall be used for bonding veneer sheets. Its adhesiveness shall be durable against outdoor atmosphere in long period and humid exposure.	(1) A plywood consisting of veneer core shall be admitted in a cyclic boil test. (2) A plywood consisting of special core sheet shall be admitted in Type 1, soak delamination test.	The plywood having perfect water resistant nature is used for boat, sign board, concrete form, fence, exterior material of house, weathering door, exterior door, sheathing, kitchen room, interior work of bath room, flooring material, or interior or exterior material of vehicle and ship.
Type 2	Common water resistance	Urea resin or the same or the better quality of adhesive agent shall be used for bonding veneer sheets. Its adhesiveness shall be durable against common atmosphere and humid exposure.	(1) A plywood consisting of veneer core shall be admitted in hot and cold soaking test. (2) A plywood consisting of special core sheet shall be admitted in Type 2, soak delamination test.	The plywood having common water resistant nature is used for interior material of house, underlayment for mats (Tatami), interior door, top of desk and dinner table, high quality furniture, radio cabinet, television cabinet, electric gramophone cabinet, and musical instrument.
Type 3	Non water resistance	A mixed adhesive agent of urea resin and additive, or the same or better quality of adhesive agent is used for bonding veneer sheets. Its adhesiveness shall be durable against variation of drying and humidity under common conditions.	(1) A plywood consisting of veneer core shall be admitted in dry adhesion test. (2) A plywood consisting of special core sheet shall be admitted in Type 3, soak delamination test.	The plywood having non water resistant nature is used for interior material for general constructions, ceiling board, furniture, and fittings.

2. Moisture content

The moisture content is one of important qualities which are indispensable for plywood and in particular, this is an invisible quality, so that in order to raise a production efficiency, a plywood in some occasion may be manufactured from insufficiently dried veneers.

In accordance with the specification, it is stipulated that a plywood having less than 3 mm of thickness which is admitted in Type 3 of adhesion test shall have 16 or less of average moisture content and other kinds of plywood shall have 14 percent or less of average moisture content.

The 16 percent of figure for the plywood, Type 3 having less than 3 mm of thickness which is stipulated in the specification is duly an undesirable figure.

3.

Japan Plywood Manufacturers' Association took an initiative to carry out a large number of practical investigation during a long time and referring to this results, the average moisture content of above plywood exceeds somewhat over 16 percent of figure.

However, Japan Plywood Manufacturers' Association intended desirably that all domestic use plywood shall be entirely inspected by Japanese Agricultural Standard (JAS) and further, in order to utilize the specification of JAS in a wider scope, the said Association was obliged to recognize so-called 16 percent of dissatisfactory figure as a temporary, transient measure.

Therefore, inspectors of Japan Plywood Inspection Corporation in the charge of guidance as a matter of course and further personnels in plywood production plants must recognize intensively that 16 percent of average moisture content stipulated in the specifications is a dissatisfactory figure.

In particular, for a blank plywood for a precisely process, even 14 percent of average moisture content, in major case is dissatisfactory. In occasion that the blank plywood is manufactured, sufficient investigations and researches must be carried out on kinds and methods of processability and thereby an appropriate moisture content must be necessarily determined.

As defects which are caused with influence of higher or lower moisture content, an inferior adhesiveness, an inferior workmanship, a warp, a crook, a surface check and various processing deterioration in the secondary processing step are cited out.

3. Quality of plywood face

(1) The grade for common plywood is determined by a quality of its surface alone. Generally, an adhesiveness and a moisture content are an invisible factor, so that superior or inferior quality of plywood, in major case, is determined by easily perceptible aesthetic aspect of the plywood surface. Consequently, the quality of the plywood surface has a very important factor.

According to the Grading Rule by the surface quality, a plywood which comprises using a domestic species veneer as a top surface sheet, is graded into three grades, i.e., Grade 1, Grade 2 and Grade 3 and hereinafter, this plywood is called as "Domestic species plywood."

Further, a plywood which comprises using a veneer sheet other than domestic species veneer sheet, in the other words, using mainly a lauan veneer sheet, as a top surface sheet is classified into the following three grade; and hereinafter, this plywood is called as "Lauan species plywood."

(i) A plywood having less than 3 mm of thickness which is employed for a temporary construction material or a sheathing material is graded as "Grade 1, approved."

(ii) A plywood which is employed for a blank board as a processing material producing overlay plywood, printed plywood or coated or painted plywood is graded as "Blank board Grade 1, approved."

(iii) Other plywood, expect plywoods stipulated in items (i) and (ii), in the other words, a common Lauan plywood is graded as "Grade 1" and "Grade 2." As defects which may be elements of above Grading Rule, a natural defect such as occurrence of knots or discoloration and a defect on processing step such as patching conditions or core separation are cited out. Further, above Grading Rules is exercised by taking in consideration conditions and degrees that those defects appear on the plywood surface, but formation of these defects is disregarded for determing the grades.

The standard of the quality which is determined by these defects is explained in paragraphs of commentary of the specification, so that the explanation is abbreviated here.

(2) Quality of back surface

The quality of the back surface is similarly stipulated for "Domestic species plywood" and "Lauan species." Requirement for the quality of the back surface is very easy in the viewpoint of its use purpose and generally, the quality of the back surface which does not give any obstacle upon its utilization, in major case is acceptable, so that expression of individual defect is extremely simplified.

4. Core sheet or crossband sheet

The specification stipulates that a core sheet or crossband sheet which shall be free from any defect affecting the top surface and can maintain its effect is acceptable. Practically, this judgement must be given on occasion that the quality of the top surface is inspected and any other judging method is not able to resort. So, above stipulated item rather belongs to a category of production guidance.

5. Finishing for side face and end face

The finishing for side face and end face has been hitherto handled in an item of "External appearance." This involves a content which is difficult to handle in an item of "The quality of top surface," so that another item is individually established for the said finishing. The specification stipulates that angles of four corners shall be correctly cut and the finishing shall be favourable. This stipulation is entirely same to the contents of previous specification or other plywood specifications.

6. Tolerances for sizes

According to the specification, tolerances for sizes are stipulated for three items, in the others words, a thickness, a width and a length. Particularly, "Double check" is required for determining the tolerance of thickness. A vital point of plywood is called as firstly adhesive strength and secondly thickness.

On account of plywood having insufficient short thickness, an useless, troublesome conflict arises in the viewpoints of price and quality determination. Therefore, it is desired that a plywood having short thickness shall not be transacted as a price of the plywood having correct thickness, but a right marking shall be given on the plywood having short thickness and it is transacted as a plywood having a marked thickness.

The specification stipulates a tolerance to a difference between the actually measured size and the marked size. An origin of currently transacted plywood having 2.7 mm of thickness comes from above reason. A limit of tolerance in the specification is frequently regarded as a manufacturing level and consumers show earnest desire to the correct marking of plywood.

Therefore, the tolerance of the thickness is severely specified and plus and minus tolerances are stipulated for a thickness of one plywood sheet and simultaneously, a minus tolerance is stipulated for one measured unit containing 10 sheets of plywood and the said minus tolerance is more severely stipulated than the thickness tolerance of one sheet and thus detrimental matter is removed.

Further, taking in consideration the practical requirements, a minus tolerance is not stipulated for width and length, and a plus 10 mm of tolerance for width and a plus 15 mm of tolerance for length are both stipulated. These tolerances were stipulated by taking in consideration that the plywood maybe impaired in a step of general transportation or handling procedure.

I. STANDRDS AND COMMENTARY

(I) Applicable Scope

Article 1. This standard shall be applicable to common plywood, other than combustion resistant plywood, plywood for fire proof door and plywood for concrete forming.

(Commentary)

Japanese Agricultural Standard enacted on the basis of Agriculture and Forestry Commodity Law, Law #175, 1950 is generally called as JAS, in the other word, an abbreviated name of Japanese Agricultural Standard.

The JAS of plywood involves five kinds of standards for common plywood, concrete form plywood, specialty plywood, combustion resistant plywood, and plywood for fire proof door.

Consequently, the applicable scope for the JAS of common plywood aims at a specification of common plywood as its object. In order to avoid double stipulations, those specifications to concrete form plywood, specialty plywood, combustion resistant plywood, and plywood for fire proof door are excluded.

Generally, a plywood comprises numerous kinds of plywood which can be classified in accordance with (1) its construction based mainly on kinds of used core, (2) its adhesive grade, (3) its surface conditions based mainly on kinds of processed surface and (4) its use. However, a constitution of plywood is defined by overlapping those classifying elements, so that a kind of plywood can not be clearly discriminated by one individual element alone. According to the classification of plywood by "JAS" specification, a common plywood is discriminated from a special plywood on the basis of "classification of surface condition" which is generally used and thereby both specifications are separated.

Further, concrete form plywood, combustion resistant plywood and plywood for fire proof door have peculiar properties and a plywood which is employed for particular purpose is considered as their objects.

On this occasion, a concrete form plywood, a combustion resistant plywood and a plywood for fire proof door, if peculiar qualities such as adhesive strength, rigidity, combustion resistance and fire proof are disregarded, can be put into a category of common plywood or specialty plywood on the basis of its surface processing conditions.

As a method of applying a plywood to classification of standard, the plywood which has bending rigidity, combustion resistance or fire proof must be handed as concrete form plywood or combustion resistant plywood or plywood for fire proof door, before it is put into a category of common plywood or specialty plywood.

(II) Definition

Article 2. In this specification, terminological definition in left columns of the following Table shall be accorded with descriptions stipulated in right columns of the same Table.

Terminology	Definition
Common plywood	The common plywood designates a plywood, a surface of which is not treated with overlaying, printing or coating processing.
Combustion resistant plywood	The combustion resistant plywood designates a plywood which is stipulated in Article 1, Japanese Agricultural Standard of Combustion resistant plywood on the basis of Ministry of Agriculture & Notification #623, 15 June 1961.
Plywood for fire proof door	The plywood for fire proof door designates a plywood which is stipulated in Article 1, Japanese Agricultural Standard of plywood for fire proof door on the basis of Ministry of Agriculture & Forestry, Notification #29, 16 January, 1961.
Concrete form plywood	The concrete form plywood designates a plywood which is stipulated in Article 2, Japanese Agricultural Standard of concrete form plywood on the basis of Ministry of Agriculture & Forestry, Notification #932, 30 June 1967.
Type 1	The Type 1 plywood means a plywood which is durable against exposure in exterior atmosphere and humidity in long period and has a satisfactory adhesiveness so as it may show perfect water resistance. The plywood, Type 1, according to the kinds of plywood shall be admitted in one of items stipulated in the following specification. (1) A plywood, in which a grain direction of single veneer intersects rectangularly with another grain direction of adjacent single veneer as a structure of veneer core shall be admitted in a cyclic boil test. (2) A plywood, in which a grain direction of single veneer intersects rectangularly with another grain direction of adjacent single veneer in one layer and simultaneously a grain direction of single veneer is in the parallel to another grain direction of adjacent single veneer in another layer as a structure of veneer core, shall be admitted in above-mentioned cyclic boil test(1); and the said layer having the parallel grain directions shall be admitted in a soak delamination test for Type 1. (3) A plywood containing a special core shall be admitted in a soak delamination test for Type 1.

(Cont'ed)

Terminology	Definition
Type II	The Type II plywood designates a plywood which is durable against exposure in ordinary exterior atmosphere and humidity and has a satisfactory adhesiveness so as it may show a high degree of water resistance. The plywood, Type II, according to the kinds of plywood shall be admitted in one of items stipulated in the following specification. (1) A plywood in which one grain direction of single veneer intersects rectangularly with another grain direction of adjacent single veneer as a structure of veneer core, shall be admitted in a hot and cold soaking test. (2) A plywood, in which a grain direction of single veneer intersects rectangularly with another grain direction of adjacent single veneer in one layer and simultaneously a grain direction of single veneer is in the parallel to another grain direction of adjacent single veneer in another layer as a structure of veneer core, shall be admitted in above mentioned hot and cold soaking test (1); and the said layer having the parallel grain directions shall be admitted in a soak delamination test for Type II. (3) A plywood containing a special core shall be admitted in a soak delamination test for Type II.
Type III	The Type III plywood designates a plywood which has a satisfactory adhesiveness so as it may show a common humid resistance; and the plywood, Type III, according to the kinds of plywood shall be admitted in one of items stipulated in the following specification. (1) A plywood in which one grain direction of single veneer intersects almost rectangularly with another grain direction of adjacent single veneer shall be admitted in a dry adhesion test. (2) A plywood, in which one grain direction of single veneer intersects almost rectangularly with another grain direction of adjacent single veneer in one layer and simultaneously one grain direction of single veneer is in the almost parallel to another grain direction of adjacent single veneer in another layer as a structure of veneer core, shall be admitted in above-mentioned dry adhesion test; and further, the said layer containing the parallel grain directions shall be admitted in a soak delamination test for Type III.

(Cont'ed)

Terminology	Definition
Type III (Cont'ed)	(3) A plywood containing a special core shall be admitted in a soak delamination test for Type III.

Note: (1) The testing methods in regard to a cyclic boil test, a soak delamination test for Type I, a hot and cold soaking test, a soak delamination test for Type II, a dry adhesion test and a soak delamination test for Type III shall be accorded with processes stipulated in Separate Paragraph 1.

(2) Judgement for testing results of above tests (1) shall be accorded with items stipulated in Separate Paragraph 2.

(Commentary)

According to this definition, terminologies which must be manifestly cleared out, among numerous terminologies in the specification of common plywood are particularly defined. Unless those terminologies are cleared out, a serious hindrance will be brought forth upon interpretation and practical exercise of the specification. The main terminology is classified into two parts, in the other words, it comprises a definition for the kind of plywood and another definition for the kind of adhesiveness. Further, the kind of plywood is explained in a paragraph of "Applicable Scope" and the kind of adhesiveness is explained in a paragraph of "Outlines for Japanese Agricultural Standard of Common Plywood," so that further explanation in detail is abbreviated here.

(III) Standard for Common Plywood containing a Veneer Sheet of Domestic Species as a Top Surface Sheet

Article 3. A specification for common plywood containing a veneer sheet of domestic species as a top surface sheet is stipulated as follows:

Item	Standard of quality			
Degree of adhesion	It shall be accorded with adhesiveness by Type I, Type II or Type III.			
Moisture content	It shall be admitted in a test of moisture content.			
Quality of sheet surface	It shall be accorded with those items stipulated below.			
Core sheet or crossband sheet	It shall be free from any defect affecting a top surface of plywood. Its quality shall maintain function of the core sheet or the crossband sheet.			
Finishing degree of side surface and end surface	Four corners shall be cut with correct angle. Finishing workmanship shall be favourably good.			
Tolerances for sizes	Thickness	A measured thickness for each sheet and 10 sheets shall not exceed the following tolerances.		
		Thickness (mm)	Measured thickness for one sheet (%)	Measured thickness for ten sheets (%)
		Less than 5 mm	±5	-3
		5 to less than 10 mm	±4	-2
		10 to less than 20 mm	±3	unspecified
		20 mm or more	±2	unspecified
	Width	+10 mm		-0
	Length	+15 mm		-0

Note 1. Testing method for moisture content shall be accorded with items stipulated in Separate Paragraph 1.

Note 2. Judgement for above testing results shall be accorded with items stipulated in Separate Paragraph 2.

(Commentary)

In order that plywood may surpass over other materials in a market competition and exploitation for the furthermore demand may be launched, a correct using process of the plywood must be exhaustively extended with high priority and sound utilization must be necessarily planned. To achieve this purpose, the standard of "JAS" which is a key to quality of plywood must be necessarily propagated as a comprehensible, easily employable rule.

The old standard had involved intricate constitutions and even if an inspector as a specialist was difficult to exercise this old standard. Further, as a matter of course, it has involved very difficult and unintelligible points for general consumers.

In so far as the previous situations were concerned, the extention of "JAS" Standard was almost impossible to exercise and furthermore, various policies for price stabilization and demand exploitation on the basis of "JAS" Standard were also impossible to perform.

Consequently, the standards were entirely amended at present and a focal point of enactment of the new standard was to simplify a constitution of the standards and thereby, to institute the comprehensive standard.

In respect to the contents of the standards, the explanations are given in a paragraph of "Outlines of Japanese Agricultural Standards," so that an explanation in detail is abbreviated here.

According to the amended standards, six items which comprise "the degree of adhesiveness" through "the tolerances of sizes" are shown in a simplified table and thereby a constitution of standards is simplified and an initial purpose is almost perfectly achieved.

2. A standard for quality of surface of veneer sheet in the preceding Article is stipulated as follows:

(a) Quality for top surface of veneer sheet

Standard of quality / Item	Grade 1	Grade 2	Grade 3	Interpretation of technical term
A total number of sound knot, hole, bark pocket and pitch pocket having a maximum diameter of 5 mm or more	The total number shall not exceed 3 multiples of digit number which expresses an area of veneer surface in a square meter unit. Above 3 multiple of digit number shall be an integer and if the said digit number has a fraction, "1" shall be added to the said integer.	The total number shall not exceed 4 multiples of digit number which expresses an area of veneer surface in a square meter unit. Above 4 multiple of digit number shall be an integer and if the said digit number has a fraction, "1" shall be added to the said integer.	The total number shall not exceed 5 multiples of digit number which expresses an area of veneer surface in a square meter unit. Above 5 multiple of digit number shall be an integer and if the said digit number has a fraction, "1" shall be added to the said integer.	(Total number) The total number means a maximum number of allowable defects on a veneer surface, in the other words, sound knot, hole, bark pocket and pitch pocket having a maximum diameter of 5 mm or more. (Digit number expressing a surface of veneer sheet) It means a digit number which expresses an area of plywood surface by an unit of square meter.
	(Commentary) For example, if a plywood has 91 cm of width and 182 cm of length, 6 pieces of sound knot, hole, bark pocket and pitch pocket having a maximum diameter of 5 mm or more are acceptable for Grade 1, and 8 pieces of above-mentioned defects are acceptable for Grade 2 and 10 pieces of above-mentioned defects are acceptable for Grade 3. But, if a plywood has one defect being not admitted in grading rule of each grade, a grade of the said plywood is degraded to a lower grade or the said plywood is disapproved, in spite of above total number.			

(Cont'ed)

Standard of quality / Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
	(Commentary) Cont'ed Further, a total number of sound knot, hole, park pocket and pitch pocket having a diameter of 5 mm or less is not limitlessly acceptable. Those defects having a maximum diameter of 5 mm or less shall be graded with the same aesthetic evaluation which is applied to the defects having a maximum diameter of 5 mm or more. Practically, if a plywood has an acceptable total number of the defects having a maximum diameter of 5 mm or more, together with the defects having a maximum diameter of 5 mm or less, a specified item for pin knot shall be applied to the said plywood. Thus, the aesthetic evaluation, in the view point of combining the defect having a maximum diameter of 5 mm or more with the defect having a maximum diameter of 5 mm or less, shall be applied to the said plywood and thereby it is desirably graded.			
Sound knot	A maximum diameter of 15 mm or less is acceptable. But, a maximum diameter of 20 mm or less is acceptable for a plywood containing material of coniferous tree as a top surface veneer. (Hereinafter, the material of coniferous tree is abbreviated as a conifeous material.	A maximum diameter of 20 mm or less is acceptable. But, for a coniferous material, a maximum diameter of 30 mm or less is acceptable.	Unspecified	(Sound knot) It means a knot, knot part is perfectly combined with a knot surroung, and the knot part and the knot surrounding are sound and free from fissure, depression, hole and decay.

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
	(Commentary) (1) A size of knot is determined by measuring a maximum diameter of the said knot, wherein a rim of the knot is excluded from above measurement. If the rim of the knot is conspicuously colored and it is difficult to discriminate from an inner part of the knot by its appearance, the said rim is regarded as one part of the knot. (2) If a knot is perfectly repaired, the said knot is regarded as a sound knot. A repairing degree shall be determined by applying to specified items in a paragraph of "repairs."			
Dead knot	A maximum diameter of 6 mm or less is acceptable. But, a maximum diameter of 10 mm or less is acceptable for coniferous material	A maximum diameter of 10 mm or less is acceptable. But, a maximum diameter of 15 mm or less is acceptable for coniferous material.	A maximum diameter of 30 mm or less is acceptable.	(Dead knot) It means a knot in which an inner part of the knot is separated from its surrounding tissue.
	(Commentary) A measurement for a size of the ded knot shall be accorded with a measuring method of the sound knot.			
Knot hole	A maximum diameter of 3 mm or less is acceptable for a knot hole which is filled and perfectly repaired. But, a maximum diameter of 4 mm or less is acceptable for a knot hole of the coniferous sheet which is filled and perfectly repaired.	A maximum diameter of 3 mm or less is acceptable for a knot hole. But, a maximum diameter of 5 mm or less is acceptable for a knot hole of the coniferous material.	A maximum diameter of 6 mm or less is acceptable for a knot hole. But, a maximum diameter of 10 mm or less is acceptable for a knot hole of the coniferous material.	(Knot hole) It means a knot, an inner part of which is dropped and perforated as a hole.

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
	(Commentary) (1) A size of the knot hole is determined by measuring a maximum diameter for a perforated part of the said knot which shows a hole. (2) If the other part, excluding the perforated part of the knot hole, is regarded as a sound knot, a measurement for size of sound knot is applied to it. Further, if the other part, excluding the perforated part of the knot hole, is regarded as a dead knot, a measurement for size of dead knot is applied to it. In this occasion, the measured maximum diameter shall include the perforated part of the knot hole.			
Pin knot	It shall impair its aesthetic appearance.	unspecified	unspecified	(Pin knot) A pin knot in accordance with this standard designates mainly a small knot having a maximum diameter of 5 mm or less.
	(Examples for Commentary) (1) If numerous pin knots are clustered on one part of veneer surface, this plywood is graded as Grade 2 or Grade 3. (2) If pin knots are clustered on one part of veneer surface and a number of the said knot is a few, this plywood is graded as Grade 1. (3) If pin knots are not clustered on one part of veneer surface, but those pin knots are located on position impairing the aesthetic appearance of the plywood, this plywood is graded as Grade 2 or Grade 3. (4) If a number of pin knots is somewhat few and a colour of the said pin knot is conspicuously different from colour of wood surface and its aspect shows an unsightly appearance, this plywood is graded as Grade 2 or Grade 3.			

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
Hole	A maximum diameter of 5 mm or less is acceptable for a hole which is filled and perfectly repaired.	A maximum diameter of 10 mm or less is acceptable for a hole which is filled and perfectly repaired.	A maximum diameter of 20 mm or less is acceptable.	(Hole) Regardless of any reason for formation of hole, "a perforated part" is regarded as a hole.
	(Commentary) A size of hole is determined by measuring a maximum diameter of perforated part of the hole.			
Bark pocket or pitch pocket	A maximum diameter of 20 mm or less is acceptable. But, a maximum diameter of 25 mm or less is acceptable for sheet of coniferous material.	A maximum diameter of 20 mm or less is acceptable. But, a maximum diameter of 40 mm or less is acceptable for sheet of coniferous material.	Unspecified	(Bark pocket) It means one part of bark which is intergrown into wood texture. (Pitch pocket) It means a resinous part which is sedimented in wood texture.
	(Commentary) If a bark pocket or a pitch pocket is combined with a depression or a hole, the specification of "hole" is applied to the said depression or hole. If the said depression or hole has a width of 4 mm or less, the specification of "Open split" is applied to it.			
Marks of sound burl	Slightly	unspecified	unspecified	(Marks of sound burl) It means spiral or distorted aspects of grain figures which are caused in the case of cutting knots, bark pockets and sound burls.
	(Commentary) Number, location, size and colour of the sound burl marks are mutually harmonized and those sound burl marks shall not be unsightly.			

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
	The marks of sound burls whose wood texture and colours can not be discriminated from those of knots or bark pockets, are regarded as knots or bark pockets.			
Discoloration or Stains	Slightly	Not conspicuous	unspecified	(Discoloration) It means a discolored wood texture which is caused by furgus effect or chemical reaction. (Stains) It means a change of wood color, except above-mentioned discoloration which is caused by stains of oil, ink or adhesive agent or site of stripped tape.
	(Commentary) A degree of color change on the discolored part or the stained part is very slight and an aspect of color change is harmonized with wood color in other unaffected parts and it is not so conspicuous.	A degree of color change on the discolored part or the stained part is not so clear. An aspect of color change on the discolored or stained part shows an unsightly harmony in comparison with wood color in other unaffected part. It does not give any hindrance on its utilization.		
Decay	None	Very slight	Slight	(Decay) It means a wood part which is affected with encroachment of wood decaying furgus. A texture of the said wood part is softened or brittle.
		A decayed area is very small. A softened or brittle degree of wood texture is slight on the decayed area.	A decayed area is small. A softened or brittle degree of wood texture is comparatively slihgt on the decayed area.	

(Cont'ed)

Standard of quality / Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
Open split or Wane	(Commentary) A wood texture which is affected with encroachment of wood decaying furgus shows a very incipient softened or brittle aspect. A decayed area which is affected with discoloration alone shall be regarded as "a defect of discoloration.			
	A maximum length of 100 mm or less and a maximum width of 1 mm or less are acceptable for the open split or the wane. An acceptable number of this defect shall be two maximum.	A maximum length of 200 mm or less and a maximum width of 1.5 mm or less are acceptable for this defect. An acceptable number of this defect shall be three maximum.	A maximum length of 400 mm or less and a maximum width of 1.5 mm or less are acceptable for this defect. An acceptable number of this defect shall be three maximum.	(Split) It means a separation of wood texture along a grain direction. (Wane) It means a drop of one wood part, i.e. a flaw of wood texture which is caused by impact strength at end part of tree.
	(Commentary) (1) A length of split or wane shall be measured from perceptible extreme ends. For a sloped split, a maximum length along a slope split shall be measured. It shall not be measured by a shortest length which connects an extreme end at cross section with another end at wood surface. (2) If two or more splits are continuously connected each other, those splits shall be regarded as one split and thereby a maximum length shall be measured. (3) A width for split or wane shall be measured at a point which indicates a maximum width.			

(Cont'ed)

Standard of quality / Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
Cross break	Extremely slight	Slight	Not conspicuous	(Cross break) It means a separation of wood texture which is caused rectangularly to grain direction.
	A maximum length of 10 percent or less in proportion to a width of plywood sheet is acceptable. Its aspect shall not be noticeable.	A maximum length of 20 percent or less in proportion to a width of plywood sheet is acceptable. It shall not affect mechanical strength of plywood.	A size of cross break is not specified, but it shall not affect mechanical strength of plywood.	
Worm hole	It shall be skillfully repaired. A total number of the worm holes shall not exceed of 3 multiples of digit number which expresses a surface area of veneer sheet by a unit of square meter. Above digit number shall be an integer and if the said digit number has a fraction, "1" shall be added to the said integer.	It shall not impair an aesthetic appearance of plywood.	unspecified	(Worm hole) It means a hole which is caused by infestation of insect.
		Unless a number of worm holes, these location and these aspects impair an aesthetic appearance of plywood, these worm holes acceptable. But the said worm holes shall not give obstacle on utilization of plywood.		

(Cont'ed)

Standard of quality / Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
	(Commentary) A worm hole which is specified as a defect in this specification designates a comparatively small hole, in the other words, a pin hole caused by erosion by "lyctus brunneus Stephens". But, a large worm hole, in the other words, so-called "Beetle hole" caused by infestation of wood borer is regarded as "hole."			
Intermixture of sapwood and heartwood. This defect is specified only for Oak and Yachidamo.	Very slightly	Not conspicuous	unspecified	(Intermixture of sapwood and heartwood) It means one part of wood surface, where a texture of sapwood is intermixed with a texture of heartwood.
	An intermixed part of wood surface shall be of small area. A variation of color tone by light and shade is slight and it is well harmonized.	Light and shade of color tone shall not be unsightly.		
Interlocked grain (Rough cut or Brushness)	Slight	Not conspicuous	Not conspicuous	(Interlocked grain) It means an abnormal part of fibrous texture of wood. Otherwise, it means fluffy fibers, coarse fibrous touch and torn grains which are liable to cause in the case of cutting or scraping wood surface against grain direction
	(Commentary) An interlocked grain located on one part alone of wood surface is acceptable. It shall not be coarse by finger's touch.	An interlocked grain located on one part alone of wood surface is acceptable. A degree of torn grain shall be slight. It does not give hindrance on utilization of plywood.	The commentary for Grade 2 is applicable here.	

(Cont'ed)

Standard of quality / Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
Joint	A color and a grain direction of jointed part shall be harmonized with those in the surrounding part. A slit shall be free from the jointed part.	A color and a grain direction of jointed part shall be harmonized with those in the surrounding part. A slit having a width of 0.5 mm or less is acceptable.	A slit having a width of 1 mm or less is acceptable.	(Joint) It means a jointed conditions of one veneer with another veneer at cross section or side section of plywood.
	(Commentary) The harmony of color and grain direction means that both jointed veneer sheets look like a single veneer sheet at one glimpse, as both colors are well harmonized.	A plywood in which a slit can be discriminated at one glimpse is graded as Grade 2.		
Finishing workmanship	Good	Comparatively good	Not rough	(Finishing workmanship) It means a finishing aspect of plywood surface with a scraper or a sander. Further, it involves removal of the remaining of tape and repairing conditions as a finishing work.
	(Commentary) Finishing workmanship by scraper or sander shall be free from any uneven portion. A remaining of tape and imperfect repair are not acceptable.	A slight uneven portion is acceptable for the finishing workmanship. A remaining of tape and imperfect reapir are not acceptable.	Finishing workmanship which does not give any hindrance upon utilization of plywood is acceptable. A slight remaining of tape on a narrow area is acceptable.	

(Cont'ed)

Standard of quality / Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
Blister or Wrinkle	None	None	Slight	(Blister) It means a smaller part on a surface of plywood which is caused by an inferior adhesion operation. (Wrinkle) It means on overlapped piece in which one part of a veneer sheet is wrongly overlapped and adhered with another veneer sheet in a pressing step of plywood manufacturing process. This defect is frequently caused with these reasons, for example, employment of corrugated veneer sheet or veneer sheet having uneven thickness or an inferior adhesion operation.
			(Commentary) An unevenness is not felt with finger's touch. In the other words, the unevenness is not so conspicuous.	
	A surface which is caused with existence of admixture between veneer sheets is regard as "an overlapped cores."			

(Cont'ed)

Standard of quality / Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
Press mark	Very slight	Slight	Not conspicuous	(Press mark) It means on uneven surface of plywood having occasionally colored part. In the case of performing a pressing operation, and admixture is inserted between veneer sheets and the said sheets are pressed and thereby, this defect, i.e. an uneven surface of plywood is caused. Further, in the case of compressing two or more plywood sheets with simultaneous pressing step, in the other words in the same trays, this defect, i.e. uneven, colored surface of plywood is caused.
	(Commentary) A number of press marks, a size, unevenness degree and coloration are scarecely noticeable. An admixture between veneer sheets is not acceptable.	A number of press marks, a size, unevenness degree and coloration are not conspicuous. An admixture between veneer sheets is not acceptable.	A number of press marks, a size, unevenness degree, and coloration do not give hindrance on utilization of plywood. An admixture between veneer sheets shall be very few.	
Warp or twist	Slight	Slight	Not conspicuous	(Warp or twist) It involves a widthwise warp, a lengthwise warp, a corrugated warp and these combined warps.
	(Commentary) If a plywood is pressed softly with hand and it is closely contacted on a horizontal plane, this defect for the said plywood is acceptable.		A warp or a twist shall not give any hindrance on utilization of plywood.	

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
Overlapped cores	An uneven surface shall be almost unnoticeable. Its number shall be two pieces or less and its maximus length shall be 150 mm or less.	Same as Grade 1.	A conspicuous, uneven surface is not acceptable; its number shall be 3 pieces or less.	(Overlapped Core) It means an overlapped, and adhered part of core sheets or crossband in a structure of plywood.
	(Commentary) A specified item of "an uneven surface shall not be almost noticeable" means that the uneven surface can not be almost felt with finger's soft touch.		(Commentary) A specified item of "a conspicuous, uneven surface is free therefrom," means that a conspicuous uneven surface can be felt with finger's soft touch.	
Core void	A colored part and a touch of uneven surface shall be very slight. Its number shall be two pieces or less. A maximum width of 3 mm or less is acceptable.	Same as Grade 1.	A colored part and a touch of uneven surface shall not be conspicuous. Its number shall be 4 pirces or less.	(Core void) It means a defect that a core sheet or an cross-band sheet being accompanied with a slip is pressed in a step of manufacturing plywood. Generally, this defect is called as "tunnel" which causes a streak line on top surface of plywood. It affects conspicuously an aesthetic appearance and a mechanical strength of plywood.
	(Commentary) A specified item of "a colored part and a touch of uneven surface shall be very slight" means that the colored degree is very slight and the uneven surface can not be felt and discriminated with finger's soft touch.		(Commentary) A specified item of "a colored part and a touch of uneven surface shall not be so conspicuous" means that the	

(Cont'ed)

Standard of quality / Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
			(Commentary) cont'ed colored part does not impair an aesthetic appearance of plywood and the remarkable uneven surface can not be felt with finger's soft touch and it does not give any hindrance on its mechanical strength of plywood.	
Uneven thickness of core sheet	Slight	Slight	Not conspicuous	(Uneven thickness of core sheet) It means that, if one core veneer sheet having uneven thickness is used, or two or more core veneer sheets showing a variation to the overlapped thicknesses are used, or a core veneer sheet having a partial depression is used, there appear an uneven aspect and a rough finish on top surface of plywood.
	(Commentary) It means that the uneven thickness can not be felt with finger's soft touch on its surface and its uneven aspect can not be discerned.		It means that the uneven thickness can not be felt so conspicuously with finger's soft touch and its uneven aspect can not discerned so conspicuously.	

(Cont'ed)

Standard of quality / Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
Repairs	A veneer surface shall be dexterously repaired.	Same as Grade 1.	A veneer surface shall be repaired without impairing its aesthetic appearance so much.	(Repairs) It means that a defect such as knot hole, split and hole is completely removed from the veneer surface and then a plugging wood piece or a synthetic resin plug is filled at these sites where above defect is removed.
	(Commentary) If a plugging wood piece is used for the repairing procedure, the said piece shall be harmonized with a wood color and a grain direction of the surroundings. A slit, a released piece and a cave-in piece are not acceptable at the plugged part. If a synthetic resin plug is employed, its color shall be harmonized with the surrounding color. It must be flatly finished and a released piece and a cave-in piece are not acceptable.		As a plugging wood piece, a released piece and a cave-in piece are not acceptable. The said wood piece shall be harmonized with a grain direction and a wood color of the surroundings.	
Grooving work or other processing work	It shall be uniformly worked. Favorably good.	Same as Grade 1.	Same as Grade 1.	(Grooving work and other processing work) It means a workmanship which comprises processing a surface of plywood by using a grooving cutter, a boring and drilling machine, an embossing machine and other mechanical working machines.
	(Commentary) A depth and a width of the groove shall have uniform sizes for workmanship of groove cutting process, and its scraping work shall be favorably good. For workmanship by a boring and drilling machine and an embossing machine, it shall be aesthetically harmonized. Its processing degree shall be favorably good.			

(Cont'ed)

Standard of quality / Item	Grade 1	Grade 2	Grade 3	Commentary of technical term
Other defects	Slight	Not conspicuous	Same as Grade 2.	(Other defects) It means defects other than those above defined defects which are previously stipulated in above standards of quality.
	(Commentary) Other defects which can be judged as a slight conditions in the aesthetic and utilizing viewpoint are acceptable.	Other defects which do not give any hindrance on utilization of plywood are acceptable.	Same as Grade 2.	

(b) Quality for back surface sheet

Item	Standard of quality
Knot hole and hole	A maximum diameter of 50 mm or less is acceptable for a depressed part.
Open split or wane	A maximum width of 10 mm or less and a maximum length of 50 percent or less in proportion to a length of veneer sheet are acceptable for this defect. Otherwise, a maximum width of 15 mm or less and a maximum length of 30 percent or less in proportion to a length of veneer sheet are acceptable for this defect.
Blister, wrinkle and flaws	Not conspicuous
Joint	The joint shall be free from a conspicuous slit.
Processing workmanship	Favorably good.
Other defects	Those defects shall not give hindrance on utilization of plywood.

(Commentary)

In respect to items of defects, standard of quality, and terminological interpretations stipulated terms for quality of top surface of plywood are similarly applicable to the quality of reverse surface of plywood. A quality for the reverse surface of common plywood, except a both surface utilizable plywood and a special use blank plywood which does not give hindrance upon utilization of plywood is acceptable. So, those defects are stipulated by expressing sizes of defects with figures. In respect to defects other than "knot hole and hole" and "Open split and wane", those must be scrutinized and judged, whether those defects give hindrance upon utilization of plywood or not. The scrutiny and the judgement shall be carried out by referring to the same defects on the top surface of veneer sheet.

(IV) Standard for Common Plywood containing a Veneer Sheet of Species except Domestic Species as a Top Surface Sheet

Article 4. A standard for common plywood which comprises using species except domestic species as a material to top surface of plywood is stipulated as follows.

Item	Standard of quality			
Degree of adhesiveness	The adhesiveness shall be accorded with the specified items of Type I, Type II or Type III.			
Moisture content	The moisture content shall be admitted in a test of moisture content.			
Quality of sheet surface	It shall be accorded with those specified items stipulated below.			
Core sheet and crossband sheet	It shall be free from any defect affecting a top surface of plywood. Its quality shall maintain function of the core sheet or the crossband sheet.			
Finishing degree of side surface and cross section surface	Four corners shall be cut with correct angle. Finishing workmanship shall be favorably good.			
Tolerances for sizes	Thick-ness	A measured thickness for each sheet and 10 sheets shall not exceed the following tolerances.		
		Thickness	Measured thickness for one sheet (%)	Measured thickness for ten sheets (%)
		Less than 3 mm	±5	-3
		3 to less than 7 mm	±4	-2
		7 to less than 20 mm	±3	
		20 mm or more	±2	
	Width		+10 mm	-0
	Length		+15 mm	-0

Note 1. Testing method for moisture content shall be accorded with items stipulated in Separate Paragraph 1.

Note 2. Judgement for above testing results shall be accorded with items stipulated in Separate Paragraph 2.

(Commentary)

The commentary of this standard can be satisfactorily referred with explanations in the paragraph of "Outlines of the Standard" and the paragraph of "the standard of common plywood which comprises using a veneer of domestic species as a top surface of plywood in Article 3," so that the more explanation is abbreviated here.

2. A standard for quality of veneer sheet surface in a previous paragraph is stipulated as follows:

(a) Quality for top surface sheet

Standard of quality / Item	Grade 1	Grade 2	Commentary of terms
A total number of sound knot, dead knot, bark pocket and pitch pocket having a maximum diameter of 5 mm or more.	The total number shall not exceed 5 multiples of a digit number which expresses an area of veneer surface in an unit of square meter. Above 5 multiples of the digit number shall be an integer and, if it has a fraction, "1" shall be added to the said integer.	The total number shall not exceed 6 multiples of a digit number which expresses an area of veneer surface in an unit of square meter. Above 6 multiples of the digit number shall be an integer and, if it has a fraction, "1" shall be added to the said integer.	(Total number of defects) It means a total number of sound knots, dead knots, bark pockets and pitch pockets having a maximum of 5 mm or more which are allowed to exist on a surface of plywood. (Digit number expressing an area of plywood surface by a unit of square meter.) It means a figure which expresses an area of plywood surface by a unit of square meter.

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Commentary of terms
	(Commentary) For example, if a plywood has a size of "91 cm of width" and "182 cm of length," 10 pieces or less of sound knots, dead knots, bark pockets and pitch pockets having a maximum diameter of 5 mm or more are allowed for Grade 1 and 12 pieces or less of above-mentioned defects are allowed for Grade 2. But, if one defect alone, out of above-mentioned defects is not admitted in a grading rule specified for each defect, this plywood is degraded or desapproved, in spite of above allowable total number. Further, sound knots, dead knots, bark pockets and pitch pockets having a maximum diameter of 5 mm or less are not limitlessly permitted. Those defects having the maximum diameter of 5 mm or less must be graded with the same aesthetic evaluation which is applied to the said defects having the maximum diameter of 5 mm or more. Practically, if a plywood has an allowable total number of the said defects having the maximum diameter of 5 mm or more and further, it has simultaneously defects having a maximum diameter of 5 mm or less, a specification for "pin knot" is applied to the said plywood; and thus, the said plywood is desirably graded with the aesthetic evaluation which summarizes totally a defect having a maximum diameter of 5 mm or more and another defect having a maximum diameter of 5 mm or less.		

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Commentary of terms
Sound knot	A maximum diameter of 25 mm or less is acceptable.	A maximum diameter of 45 mm or less is acceptable.	(Sound knot) It means an inner and a surrounding part of the knot which are entirely free from fissure, depressions, hole and decay and are healthy; and further, a knot tissue shall be perfectly combined with a tissue of the surroundings.
	(Commentary) (1) A maximum diameter is measured by excluding a rim part of the said knot. But, the rim part which is conspicuously colored and can not be discriminated from the knot shall be regarded as a portion continued with the knot. (2) A knot which is perfectly repaired is regarded as a sound knot. In respect to a degree of repair a specified item for "the repair" shall be applied to it.		
Dead knot	A maximum diameter of 15 mm or less is acceptable.	A maximum diameter of 25 mm or less is acceptable.	(Dead knot) It means a knot, an interior part of which is fissued from the surrounding tissue.
	(Commentary) A measurement for the maximum diameter of the sound knot is similarly applied to the dead knot.		
Knot hole and hole	A maximum diameter of 3 mm or less for a dropped part of the knot is acceptable.	A maximum diameter of 5 mm or less for a dropped part of the knot is acceptable.	(Knot hole) It means a knot, inner part of which is dropped indicating a perforated conditions. (Hole) It means a perforated conditions on wood surface but a reason for its occurrence is not considered.
	(Commentary) (1) A size of knot hole is determined by measuring a maximum diameter of the dropped part of knot.		

(Cont'ed)

Standard of quality / Item	Grade 1	Grade 2	Commentary of terms
	(Commentary) Cont'ed (2) If one part of the knot, other than the dropped part has a sound tissue, it is regarded as a sound knot. If one part of the knot, other than the dropped has a dead tissue, it is regarded as a dead knot. Thus, these maximum diameters are measured for them. In this occasion, the said maximum diameter may contain the dropped part.		
Pin knot	It shall not impair an aesthetic appearance of plywood.	It shall not impair so conspicuously an aesthetic appearance of plywood.	(Pin knot) According to this standard, it means a small, slender knot having a maximum diameter of 5 mm or less.
	(Commentary) A number of pin knots, these locations and these aspects shall be judged integrally. These factors shall be harmonized and shall not give an unsightly appearance on plywood surface.	A number of pin knots, these locations and these aspects shall be integrally judged. those factors shall not give a remarkable unsightly appearance on plywood surface and those factors shall not give hindrance on its utilization.	
	(Example) (1) If numerous pin knots are concentrated and located on one part of plywood surface, this plywood is graded as Grade 2. (2) If pin knots are concentrated and located on one part of plywood surface, but its number is very few, this plywood is graded as Grade 1.		

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Commentary of terms
	(Example) Cont'ed (3) If pin knots are concentrated on one part of plywood surface but those pin knots do not impair an aesthetic appearance of plywood, this plywood is graded as Grade 2. (4) If a number of pin knots is comparatively few but a color of these pin knots is very different from a color aspect of plywood surface and these pin knots give an unsightly appearance so conspicuously, this plywood is graded as Grade 2.		
Bark pocket or Pitch pocket	A maximum diameter of 30 mm or less is acceptable.	No conspicuous (Commentary) A number of bark pockets or pitch pockets, these location and these aspect shall not give an unsightly appearance and further those are harmonized. Those factors shall not give hindrance on utilization of plywood.	(Bark pocket) It means one part of bark which is intergrown into wood tissue of timber. (Pitch pocket) It means a resin part which is sedimented in wood texture of timber.
	If a bark pocket or a pitch pocket contains a depression or a hole, this corresponded part is regarded as "hole." But, if the said bark or pitch pocket has a slender width of 4 mm or less, it is regarded as "Open split."		

(Cont'ed)

Standard of quality / Item	Grade 1	Grade 2	Commentary of terms
Marks of sound burl or vine streak	Slight (Commentary) A number of sound burl or vine streak, these locations, these sizes, and these colors are well harmonized. Those factors shall not show an unsightly appearance.	Not conspicuous A number of sound burl or vine streak, these locations, these sizes and these colors are harmonized and do not show an unsightly appearance. Those factors shall not give any hindrance on utilization of plywood.	(Sound burl) It means a spiral or twisted shape of grain figures which occurs when knot, bark pocket or burl are cut. (Vine streak) It means an abnormal wood tissue which looks like a crawing site of earth worm or a beaten site of whip and is frequently revealed in lauan timber. A reason for its formation is not generally manifested, but it is regarded as a site of insect damage or a wound site mantled with ivies. This is an undesirable defect in a viewpoint of aesthetic appearance or mechanical strength.
	(Commentary) (1) A sound burl site which can not be discriminated from knot or bark pocket in a viewpoint of wood texture and wood color is regarded as knot or bark pocket. (2) If a linear vine streak is partially filled with a resinous material, the part filled with the resinous material is regarded as a pitch pocket. (3) If a split or a hole is present in an interior of the linear vine streak, the said split or hole is regarded as an open split.		

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Commentary of terms
Discoloration or stain	Slight	Not conspicuous	(Discoloration) It means a color change of wood texture which is caused with furgus attack or chemical reaction. (Stain) It means a color change of wood texture which is caused with oil, ink or adhesive agent or the other reasons than discoloration.
	(Commentary) A color change degree for a discoloration or a stain shall be slight. The said discoloration or stain shall be harmonized with other color tone of wood texture. The color change degree is not so conspicuous.	A color change degree for a discoloration or a stain is not so clear. The said discoloration or stain shall be harmonized with other color tone of wood texture so as it may not show unsightly appearance. Further, it shall not give hindrance on utilization of plywood.	
	A proper discolored pattern which is frequently in wood texture of Bagtikan out of numerous lauan species, it shows an unsightly appearance, is regarded as "discoloration." Further, a partial discolored aspect which is caused with influence of sunshine is also regarded as "discoloration."		
Decay	None	Very slight	(Decay) It means softened or brittle conditions in wood texture which is caused with infestation of wood decaying fungus.
		(Commentary) An area suffered with the decay shall be small. A softened or brittle degree of affected wood texture shall be fungus.	

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Commentary of terms
	One part of wood texture which is infested with wood decaying fungus and shows mainly a discoloration without causing softened or brittle conditions of wood, is regarded as discoloration.		
Open split or wane	A maximum length of 20 percent or less, in proportion to a length of the plywood and a maximum width of 1.5 mm or less are acceptable. Its number shall be two or less.	A maximum length of 40 percent or less, in proportion to a length, of the plywood and a maximum width of 4 mm or less are acceptable; and its number shall three or less. Otherwise, a maximum length of 20 percent or less and a maximum width of of 2 mm or less are acceptable; and its number shall be 6 or less.	(Open split) It means a separation of wood texture which is mainly caused along grain direction in wood tissue. (Wane) It means a dropped part of wood texture or a flaw of end part of plywood which is caused with impact strength.
	(Commentary) (1) A length of open split or wane shall be measured from a discernible extreme end. Further, a length of sloped split shall not be measured with a shortest straight line connecting the extreme end point with a cross section, but it shall be measured with a longest distance along the sloped split. (2) If two or more splits are connected each other in a continuous aspect, these splits are regarded as one split. (3) A width for split or wane shall be determined by measuring the maximum part of the width.		

(Cont'ed)

Standard of quality / Item	Grade 1	Grade 2	Commentary of terms
Crossbreak	Slight	Same as Grade 1	(Crossbreak) It means a transversal separation of wood texture which is caused rectangularly to a grain direction. The crossbreak is frequently visible around a pith part of Lauan, Apitong or Kapur species.
	(Commentary) A maximum length of 20 percent or less in proportion to a width of plywood is acceptable. It shall not give any influence on mechanical strength of plywood.		
Worm hole	1. A worm hole of any shape other than linear shape having a maximum diameter of 1.5 mm or less is acceptable; and the said worm hole shall be free from black rim; and the said worm holes in the aggregate existence are not acceptable. 2. A linear worm hole being free from a black rim and having a maximum diameter of 10 mm or less is acceptable; and a number of the said linear worm holes shall not exceed four multiples of a digit number which expresses an area of veneer surface in an unit of square meter.	Not conspicuous	(Worm hole) It means a perforation of wood surface which is caused with infestation of insects.

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Commentary of terms
	(Cont'ed) The said digit number shall be on integer and if the said digit number has a fraction, "1" shall be added to it.		
	(Commentary) A specified item of "the worm holes are not present in the aggregate existence" means that the worm holes shall not be concentrated in one portion of veneer surface; and a number of the said worm holes shall be several pieces. The presence of the worm holes which shows an unharmonized conditions in aesthetic viewpoint of veneer surface shall be understood as the previous specified terms of "Worm holes in the aggregate existence".	A number of worm holes, its location and its aspect shall not impair an aesthetic appearance of plywood; and further those factors shall not give any hindrance upon utilization of plywood.	
	A worm hole specified here designates a somewhat small hole, i.e. a pin hole which is mainly caused with infestation of lyctus brunness Stephens and the like. On the other hand a large worm hoke, e.g. Beetle hole which is caused with infestation of "Borer" is regarded as a hole.		

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Commentary of terms
Interlocked grain (Rough cut or Brashness)	Slight	Not conspicuous	(Interlocked grain) It means an abnormal part of fibrous texture of wood. Otherwise, it means fluffy fibers, coarse fibrous touch and torn grain which are liable to cause in the course of cutting or scraping against grain direction.
	(Commentary) An interlocked grain on one part alone of wood surface is acceptable. It shall not give coarse feeling by finger's soft touch.	An interlocked grain on one part alone of wood surface is acceptable. A degree of torn grain shall be slight. It does not give hindrance on utilization of plywood.	
Joint	A color tone of jointed part shall be harmonized those in the surrounding. A slit shall be free from the jointed part.	A slit of the jointed part shall not be so conspicuous.	(Joint) It means a jointed conditions of one veneer with another veneer at cross section or side section of plywood.
	(Commentary) The harmony of the color tone means that both jointed veneer sheets look like a single veneer sheet at one glimpse, as both colors are well harmonized.	A plywood in which a slit can be discriminated at one glimpse is graded as Grade 2.	

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Commentary of terms
Finishing workmanship	Good (Commentary) Finishing workmanship by scraper or sander shall be free from any uneven portion. A remainder of tape and imperfect repair are not acceptable.	Not rough Finishing workmanship which does not give any hindrance on utilization of plywood is acceptable. A slight remainder of tape on a narrow area is acceptable.	(Finishing workmanship) It means a finishing aspect of plywood with a scraper and a sander. Further, it involves removal of the remainder of the tape and repairing conditions as a finishing work.
Blister	None (Commentary) A blister which is caused with admixture between both veneer sheets is regarded as an overlapped core.	Slight	(Blister) It means a portion swollen on surface of plywood which is caused by an inferior adhesion operation.
Wrinkle	None	Slight (Commentary) An overlapped portion shall be a small area, and it shall not be so conspicuous.	(Wrinkle) It means an overlapped portion of veneer sheets which is caused by overlapping and adhesion of one part of one veneer sheet on another veneer sheet in a pressing step of plywood manufacturing process. This defect is frequently caused on account of these reasons, e.g. employment of corrugated veneer sheet or veneer sheet having unhomogeneous thickness or inferior adhesion operation.

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Commentary of terms
Press mark	Slight	Not conspicuous	(Press mark) It means an uneven surface of plywood having occasionally colored part, which is caused by pressing veneer sheets containing the inserted admixture between them or by pressing simultaneously two sheets or more of plywood in the same tray in the case of performing the pressing operation.
	(Commentary) A number of press marks, its size, unevenness degree and coloration of press marks are not almost noticeable. An admixture between veneer sheets is not acceptable.	A number of press marks, its size, unevenness degree and coloration of press marks shall not give any hindrance on utilization of plywood. An admixture between veneer sheets shall be very few.	
Warp or twist	Slight	Not conspicuous	(Warp or twist) It involves a widthwise warp, a lengthwise warp, a corrugated warp and these combined warps.
	(Commentary) If a plywood is softly pressed with hand, the said plywood can be closely contacted on a horizontal plane. A warp or a twist in above-mentioned degree is acceptable.	A warp or a twist which does not give any hindrance on utilization of plywood is acceptable.	
Overlapped cores	An uneven surface shall be almost unnoticeable. Its number shall be two pieces or less and its maximum diameter shall be 150 mm or less.	A conspicuous uneven surface shall be unnoticeable. Its number shall be three pieces or less.	(Overlapped cores) It means an overlapped and adherred part of core sheet or crossband in a structure of plywood.

(Cont'ed)

Standard of quality / Item	Grade 1	Grade 2	Commentary of terms
	(Commentary) A specified item of "an uneven surface shall be almost unnoticeable" means that the uneven surface can not be felt with finger's soft touch.	A specified item of "a touch of conspicuous uneven surface is none" means that a conspicuous uneven surface can not be felt with finger's soft touch.	
Core void	A colored part and a touch of uneven surface shall be slight. Its number shall be two or less. (Commentary)	A colored part and a touch of uneven surface shall not conspicuous. Its number shall be four or less.	(Core void) It means a defect caused in such a manner that a core sheet or a cross-band sheet being accompanied with a slip is pressed and adherred in a step of plywood manufacturing processes. Generally, this defect is called as "tunnel" and further it causes a streak line on top surface of plywood. It affects conspicuously aesthetic appearance and a mechanical strength of plywood.
	A specified item of "a colored part and a touch of uneven surface shall be slight" means that the colored degree is very slight and the uneven surface is not be felt with finger's soft touch.	A specified item of "A colored part and a touch of uneven surface shall not be conspicuous" means that a degree of the colored part does not impair an aesthetic appearance of plywood and the uneven surface is not be felt so conspicuously with finger's soft touch and further it does not affect the mechanical strength of plywood.	

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Commentary of terms
Uneven thickness of core sheet	Slight	Not conspicuous	(Uneven thickness of core sheet) It means that, if one core veneer sheet having uneven thickness is used, or two or more core veneer sheets showing a variation to the overlapped thickness are used, or a core veneer sheet having a partial depression is used, there appear an uneven aspect and rough finish on top surface of plywood.
	(Commentary) It means that the uneven thickness can not be felt with finger's soft touch on its surface and its uneven aspect can not be almost discerned.	It means that the uneven thickness can not be felt so conspicuously with finger's soft touch on its surface and its uneven aspect can not be discerned so conspicuously.	
Repairs	A veneer surface shall be deterously repaired.	A veneer surface shall be repaired without repairing its aesthetic appearance.	(Repairs) It means that a defect such knot hole, split and hole is completely removed from the veneer surface and then, a plugging wood piece or a synthetic resin plug is filled at those sites where above defect is removed.
	(Commentary) If a plugging wood piece is used for the repairing procedure, the said pieces shall be harmonized with a wood color and a grain direction of the surroundings. A slit, a released piece and a cave-in piece are not acceptable. If a synthetic resin plug is used, its color shall be harmonized with a color of the surroundings.	As a plugging piece, a released piece and a cave-in piece are not acceptable. The said plugging piece shall be harmonized with a grain direction and a wood color of the surroundings.	

(Cont'ed)

Standard of quality Item	Grade 1	Grade 2	Commentary of terms
Grooving work or other processing work	(Commentary) Cont'ed. It must be flately finished and a released piece and a cave-in piece are not acceptable.		
	It shall be uniformly worked. Favorably good.	Same as Grade 1	(Grooving work or other processing work) It means a workmanship which comprises processing a surface of plywood by using a grooving cutter, a boring and drilling machine, an embossing machine and other mechanical working machines.
	(Commentary) For workmanship of groove cutting process, a depth and a width of the groove shall have uniform sizes and its scrapping work shall be favorably good. For workmanship with a boring and drilling machine and an embossing machine, the said workmanship shall be aesthetically harmonized. Its processing degree shall be favorably good.		
Other defects	Slight	Not conspicuous	(Other defects)
	Other defects which can be judged as a slight conditions in the aesthetic and utilizing viewpoint are acceptable.	Other defects which do not give any hindrance on utilization of ply wood are acceptable.	It means defects, other than those above defined defects which are previously stipulated in above standards of quality.

Note 1. For a plywood having less than 3 mm of thickness, for the use of a temporary construction material or a sheathing material, "the approval" is stipulated for standard of quality and standard of Grade 2 is applied to it.

(Commentary)

In respect to a common plywood, as a temporary construction material at a construction site or a common plywood as a painted coated material, cloth or paper covered material or other sheathing materials, the essential qualities of plywood involving an adhesive strength, a moisture content and a thickness are only required to reach to specified degrees and other qualities for wood surface are frequently regarded as unimportant factor. So, in numerous cases, it is not necessary to apply a grading rule to wood surface of plywood.

Therefore, a lauan plywood having less than 3 mm of thickness which occupies a major quantity of the plywood used for above-mentioned purpose is graded as one grade, in the other words, an approved grade. This is different from other kinds of plywood. The said approved grade, i.e. a standard of approved quality is stipulated as Grade 2 or the more higher grade of lauan common plywood.

2. In respect to a plywood for purpose of overlaying, printing, painting or other processing treatments, "the approved blank board" is stipulated for standard of quality and standard of Grade 2 is applied to it.

(Commentary)

A quality of lauan common plywood, as a material employable to the blank board, is annually increasing, but requisite quality for a block board use plywood would involve a very wide range of specified items and further, the said specified items are respectively different by kinds and degrees of processing treatments.

Therefore, it is nonsense to stipulate a general grading rule for them or to apply uniformly a common standard to them.

Therefore, in respect to a plywood for purpose of blank board, one grade as "the approved grade as blank board" is only stipulated and a standard for "the approved grade as blank board" is stipulated as Grade 2 or the more higher grade of lauan common plywood.

However, a required quality for a blank board use plywood, as the secondary processing material, would be of the adequately higher level and the standard for Grade 2 can not necessarily satisfy it. Moreover, its requirements for specified items are different by kinds, degrees and methods of processing treatments and in the viewpoint of production, commodity circulation and consumption, it has been desired to enact a standardized, intensive specification for the said blank board used plywood.

Therefore, in respect to a polyester coating decorative plywood and a fancy veneered plywood, in the other words, in regard to the particularly desired agenda, Japan Plywood Inspection Corporation and concerned industries' Associations and concerned governmental officials had scrutinized and drafted "Standard of quality" for them and then, it was enacted on 16 May 1966.

At any rate, above mentioned Standard of quality is a result which was brought about by collecting the maximum common factors of various opinions among concerned industrialists, in order to adjust various requirements of manufacturers, sellers and consumers for scope of "Japanese Agricultural Standard." It is a matter of course that the said standard of quality is applied on the basis of manufacturers who receive the inspection.

(b) Quality for back surface sheet

Item	Standard of quality
Knot hole and hole	A maximum diameter of 50 mm or less for dropped portion is acceptable.
Decay	Not conspicuous
Open split or wane	The open split or wane having a maximum width of 10 mm or less and a maximum length of 50 percent or less in proportion to a length of plywood, otherwise a maximum width of 15 mm or less and a maximum length of 30 percent or less in proportion to a length of plywood is acceptable.
Brister, wrinkle and flaws	Not conspicuous
Joint	A conspicuous slit for the joint is not acceptable.
Processing degree	It shall be favorably good.
Other defects	The defects giving hindrance on utilization of plywood is not acceptable.

(Commentary)

In respect to defect items, standard of quality and terminological interpretation for the quality of back surface sheet, the corrrespondent items, standard of quality and commentary of terms for the quality of top surface sheet can be similarly used. Except a both face employable plywood and a special blank board use plywood, the quality of back surface sheet which does not give any hindrance of plywood is acceptable. Except "knot hole and hole" and "open split or wane", for which sizes of defects are specified with figures, the specifications of other defects for the quality of top surface sheet are similarly applied to the quality of back surface sheet.

Taking in consideration whether utilization of plywood is hindered or not, the back surface sheet shall be scrutinized and judged.

(V) Common Plywood, not admitted in the Specifications of Article 3 and Article 4

Article 5. Common plywood which is not admitted in the specifications of Article 3 and Article 4 is disapproved.

(Commentary)

It is a matter of course that a common plywood, not admitted in the specifications of Article 3 and Article 4 is disapproved. So, this rule is manifestly stipulated in this Article 5.

It is unavoidable that some quantities of disapproved plywood are produced in consequence of inferior quality of material logs and the other reasons.

But, a plywood plant producing disapproved plywood in the excess to a limited rate of the disapproval number in the following Table shall be judged as a plant which manages incorrect quality control.

1,

Graded quantity (sh)	Limited rate of disapproved number (%)	Graded quantity (sh)	Limited rate of disapproved number (%)
100 to 124	1.04	900 to 1,099	7.00
125 to 149	1.89	1,100 to 1,299	7.26
150 to 199	2.82	1,300 to 1,499	7.46
200 to 249	3.67	1,500 to 1,699	7.63
250 to 299	4.27	1,700 to 1,899	7.76
300 to 349	4.73	1,900 to 2,249	7.92
350 to 399	5.10	2,500 to 2,749	8.10
400 to 449	5.40	2,750 to 3,499	8.30
450 to 549	5.76	3,500 to 4,999	8.54
550 to 649	6.13	5,000 to 6,999	8.78
650 to 749	6.41	7,000 to 8,999	8.94
750 to 899	6.70	9,000 or more	9.05

(VI) Standard Sizes

Article 6. **Standard sizes of common plywood are specified as listed below:**

1. **Common plywood which comprises using a veneer sheet of domestic species as a top surface sheet.**

Length (cm)	Width (cm)	Thickness (mm)
91	91	4.0 or 6.0
182	91	3.5, 4.0, 6.0, 9.0, 12.0
213	91	4.0 or 6.0
243	122	4.0, 6.0 or 9.0

2. Common plywood which comprises using a veneer sheet of species other than domestic species as a top surface sheet.

Length (cm)	Width (cm)	Thickness (mm)
182	91	2.7, 3.0, 4.0, 5.5, 6.0, 9.0, 12.0, 15.0, 18.0 or 21.0
191	100	2.7 or 3.0
213	91	3.0, 4.0 or 5.5
243	122	4.0 or 5.5

(Commentary)

Specifications for standard sizes are unexceptionally stipulated for common construction materials, other than plywood and thereby, manufacturing, transaction and use for them are conveniently facilitated. So, taking an opportunity on the present entire alteration, standard sizes for the common plywood were stipulated.

Practically, various sizes of plywood which are constantly stocked in the first current wholesale shops are designated as objectives having standard sizes.

Consequently, if a consumer requires a plywood having specified sizes in accordance with above standard, he can obtain easily it at the first current wholesale shop. Even if at the worst case, he is not necessary to issue a special order to it.

The standard size, as Japanese characters show its significance manifestly, means a specified, standardized size. Further, if a plywood has special sizes other than the standard sizes and can be designated as an objective of the specification, as a matter of course, it can be optionally expressed with the mark of "JAS."

SEPARATE PARAGRAPH I. Testing Method and Judgement

1. Collection of testing samples

A sample which is furnished for the testing method is cut from a plywood sheet and hereinafter the said sample is called as a specimen and the said plywood is called as a sampling plywood.

A number of specimens which shall be collected at random from one lot of plywood package are shown in right columns of the following tablé and a number of plywood sheets contained in the said lot of plywood package are shown in left column of the same table. A specimens which has a necessary size for the testing method shall be cut from a sampling plywood.

Number of plywood sheets in one lot of plywood package	Necessary number of sampling plywood	
1,000 sh or less	2 sh or less	If a repeating test is carried out, two multiples of sampling plywood in proportion to the amount in the left column shall be extracted.
1,001 sh to 2,000 sh	3 sh	
2,001 sh to 3,000 sh	4 sh	
3,000 sh or more	5 sh	

2. Preparation of the test pieces

(1) The test pieces for "Cyclic boil," "Hot and cold soaking test" and "Dry adhesion test" shall be prepared in compliance with the following methods. In this occasion, a test piece which gives an influence on adhesive strength shall be cancelled.

(a) In respect to three plies plywood of veneer core, four test pieces shall be prepared from each sampling specimen in accordance with the following figures A and B, where Figure A is applied to a test piece consisting of top sheet or back sheet having a thickness of more than 1.6 mm and Figure B is applied to test piece consisting of top sheet or back sheet having a thickness of 1.6 mm or less, or test piece which is not to form Figure A by veneer repture.

In this occasion, one half of total test pieces shall be prepared in accordance with a direction of reverse check of core sheet and the remaining half of total test pieces shall be prepared in accordance with a contrary direction to the reverse check of core sheet.

Figure A (Unit : mm)

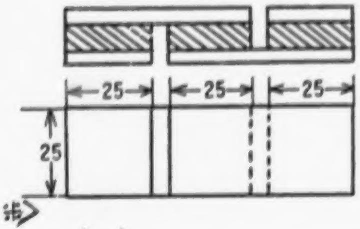
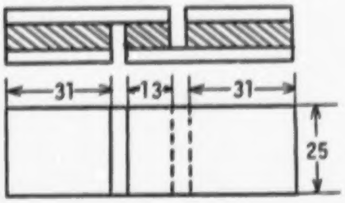


Figure B (Unit : mm)



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(Note) In case of softwood veneer is included in the composition of plywood, kerfing shall be extended two-thirds of the core ply.

are delaminated from this plywood as a specimen and thereby a three plies test piece is prepared so as the said laminated test pieces may contain any layer of the adhesion testing layers. Thus, above test piece is prepared in accordance with the previous procedure (a).

(2) For Type I soak delaminating test, Type II soak delaminating test, and Type III soak delaminating test, four test pieces having 75 square mm of surface area shall be prepared from each specimen.

(3) For test of moisture content, two test pieces having appropriate size shall be prepared from each specimen.

3. Testing method

(1) Cyclic boil test

The cyclic boil test shall be performed in such manner that a test piece is immersed in a boiling water during four hours and then, it is dried at a temperature of 60°C ± 3°C during twenty hours and further, it is again immersed in a boiling water during four hours and then, it is dipped into water at room temperature until this warm test piece may be cooled to the said room temperature; and a test for measuring adhesive strength is carried out to the wet test piece, in the other words, both extreme ends of the wet test piece are fixed with fastening grips and a tensile strength by 600 kg/min maximum of load rate is applied to it and a maximum strength at rupture for the test piece is measured; and further, hereinafter, this testing procedure is similarly applied to subsequent adhesion tests.

(2) Hot and cold soaking test

The hot and cold soaking test is carried out in such manner that a test piece is immersed in a hot water at a temperature of 60°C ± 3°C during three hours and the warm test piece is continuously dipped into water at room temperature until it may be cooled to the said room temperature and above-mentioned adhesion measuring test is carried out for the wet test piece.

(3) Dry adhesion measuring test

The dry adhesion measuring test is carried out by applying directly above-mentioned adhesion measuring test to an untreated, normal test piece.

(4) Type I, soak delamination test

The Type I, soak delamination test is carried out in such manner that a test piece is immersed into a boiling water during four hours and then, it is dried at a temperature of 60°C ± 3°C during twenty hours and further, it is immersed again into a boiling water during four hours and furthermore, it is again dried at a temperature of 60°C ± 3°C during three hours.

(5) Type II, soak delamination test

The Type II, soak delamination test is carried out in such manner that a test piece is immersed into a hot water at a temperature of 70°C ± 3°C during two hours and then, it is dried at a temperature of 60°C ± 3°C during three hours.

(6) Type III, soak delamination test

The Type III, soak delamination test is carried out in such manner that a test piece is immersed into a water at a temperature of 35°C ± 3°C during two hours and then, it is dried at a temperature of 60°C ± 3°C during three hours.

(7) Test for moisture content

The test for moisture content is carried out by measuring a moisture content of a test piece in accordance with a bone-drying weight method. Otherwise, another method, other than the bone-drying weight method, which can be manifestly confirmed to measure a moisture content of the objective plywood is acceptable.

Note: The bone-drying weight method is carried out in such manner that each test piece is dried in a thermostatic dryer at a temperature of 100°C to 105°C and then, a weight of the said test piece reaching to a constant weight is measured and a moisture content of the said test piece is calculated from the said constant weight by applying to a conventional formula.

SEPARATE PARAGRAPH II. Judgement for Testing Results

One lot of plywood package, if testing results for 90 percent or more of total test pieces sampled from the said lot are admitted in the following standard, is judged as an approved lot. But, if the testing results for less than 90 percent to 70 percent of the total pieces sampled from the said lot are admitted in the following standard, the specimens, i.e. sheets of sampling plywood shall be extracted from the said lot and a repetition test shall be carried out for them and then a judgement for approval or disapproval shall be given depending upon the figures of the results of repetition test.

(1) Shear strength and average wood failure (%) shall be equal to or greater than the following standard values:

Wood species used in test specimen		Average wood failure (%)	Shear strength (kg/cm^2)
Hard-woods	"Kaba"		10
	"Buna", "Nara", "Itayakaede", "Akadamo", "Shioji", "Yachidamo"		9
	"Sen", "Hoo", "Katsura", "Tabu"		8
	"Lauan", "Shina", and other hardwood species		7
Softwoods			7
		50	6
		65	5
		80	4

(Note) In case of a test specimen made up of a combination of veneers of 1.(a) different species, the lowest standard value of shear strength of species involved shall be applied.

Note 1. (b) An adhesive strength for a test piece in the shape of "A" or "B" in the Separate Paragraph I. 2 is calculated by the following formula. But, for a test piece of a plywood indicating a ratio of core sheet thickness in proportion to facial sheet thickness as a rate of 1.50 or more, above calculated adhesive strength shall be multiplied with a coefficient in the corresponded column of the following same table which is variable in accordance with the ratio of core sheet thickness proportional to facial sheet thickness; and then, the resulting multiplied figure is regarded as the adhesive strength of the said plywood.

(Hereinafter, the said ratio of core sheet thickness proportional to facial sheet thickness is abbreviated as "a rate of thickness.")

Ratio of thickness	Coefficient
1.50 to less than 2.00	1.1
2.00 to less than 2.50	1.2
2.50 to less than 3.00	1.3
3.00 to less than 3.50	1.4
3.50 to less than 4.00	1.5
4.00 to less than 4.50	1.7
4.50 or more	2.0

(i) For a test piece having a shape of Fig. A and a test piece having a shape of Fig. B to the cyclic boil test and the hot and cold soaking test in the Separate Paragraph I. 2. (1), an adhesive strength is calculated by the following formula:

$$\text{Adhesive strength (kg/cm2)} = \frac{P}{b \times h}$$

wherein p is a maximum load by an unit of kg in adhesive strength measuring test, and b is a width (cm) of adherred surface between groove and h is a length (cm) of the said adherred surface.

(ii) For a test piece having a shape of Fig. 8 to the normal adhesion measuring test in Separate Paragraph I. 2. (1) (a), an adhesive strength is measured by the following formula:

$$\text{Adhesive strength (kg/cm}^2\text{)} = \frac{P}{b \times h} \times 0.9$$

wherein p, b and h have the same significances defined in the foregoing formula (a).

(2) For Type I, soak delamination test, Type II, soak delamination test, and Type III, soak delamination test, a non stripped length, i.e. non delaminated length in the same adhered layers of the test piece shall exceed 50 mm at each side surface.

(3) For the moisture content test, an average figure of moisture contents in the test pieces collected from specimen, i.e., the same sampling plywood shall be a rate of 14 percent or less. But, for a plywood having less than 3 mm of thickness and acceptable sdhesion degree by Type III, the said average figure of the moisture content shall be a rate of 16 percent or less.

Note: A moisture content in accordance with measurement of bone-drying weight method is calculated by the following formula:

$$\text{Moisture content (\%)} = \frac{W_1 - W_2}{W_2} \times 100$$

wherein W_1 is a weight of the test piece (g)
prior to a drying step and W_2 is a bone-dried weight.

(Commentary)

In respect to the testing method in Separate Paragraph I and the judgement for the testing results in Separate Paragraph II, the said method and the said judgement were coincidentally stipulated in conformity to Export Standard of Common Plywood, (Ministry of Agriculture and Forestry and Ministry of International Trade and Industry, Ministry Ordinance #4, 13 May 1963.). So, the commentary of the said Export Standard is quoted here as interpretation and all cautions must be paid on the following items.

(1) The item of "For a test piece prepared from a plywood consisting of different wood species of veneer sheets, a lowest figure, out of standard figures of adhesive strengths for those different wood species shall be adopted for an adhesive strength of the said test piece" is stipulated in Separate Paragraph II, Judgement for testing results. The said item is explained in such manner that, if a test piece consists of for example, a facial sheet of Sen and a core sheet of lauan and a back sheet of Sen, the lowest adhesive strength of 7 kg/cm^2 or more shall be applied to the adhesive strength of the said test piece, because an adhesive strength of 8 kg/cm^2 or more is stipulated for Sen and an adhesive strength of 7 kg/cm^2 or more is stipulated for lauan species.

(2) Calculating method of adhesive strength in Separate Paragraph II. (1).

Example:

Degree of adhesive.	Type II
Kinds of core:	Veneer core
Wood species of test piece:	Facial sheet (Sen), core sheet (lauan) and back sheet (Sen).
Thickness of these veneer sheets:	Facial sheet (0.9 mm), core sheet (2.8 mm) and back sheet (1.0 mm)
A ratio of core thickness in proportion to thickness of facial sheet:	3 : 1
Shape of test piece:	Fig. B

An adhesive strength $(\text{kg/cm}^2) = \dfrac{28\ \text{kg}}{2.5^{\text{cm}} \times 1.3^{\text{cm}}} = 8.6$

$8.6\ \text{kg/cm}^2 \times 1.4$ (coefficient) $= 12\ (\text{kg/cm}^2)$

$12\ \text{kg/cm}^2 > 7\ \text{kg/cm}^2$ ..... Standard figure of adhesive strength for lauan veneer

(3) Judgement for testing results

After finishing various kinds of tests, judgements for the said tests shall be given on all kinds of tests individually.

If 90 percent or more of test pieces are admitted in approval standards of the said tests as a testing result, all sheets of plywood in the said inspection lot are regarded as approved plywood.

Further, if less than 70 percent of test pieces alone are admitted in approval standards of the said tests as a testing result, all sheets of plywood in the said inspection lot are regarded as disapproved plywood.

Furthermore, if 70 percent to less than 90 percent of test pieces are admitted in approval standards of the said tests as testing results, all sheets of plywood in the said inspection lot are qualified to receive repetition tests, in the other words, a necessary number of sampling plywood, i.e. two multiple number of the sampling plywood employed for the previous tests are collected from the same inspection lot and thereby the repetition tests are carried out; and if 90 percent or more of test pieces are admitted in approval standards of the said tests, all sheets of plywood in the inspection lot are regarded as approved plywood and if less than 90 percent of test pieces alone are admitted in the said approval standards, all sheets of plywood in the said inspection lot are judged as disapproved plywood and the more repetitions tests are not carried out.

(4) A moisture content for a plywood having less than 3 mm of thickness and Type III of adhesion degree is stipulated as a rate of 16 percent or less. If this figure is compared with 14 percent or less of moisture content stipulated for other plywood, the said figure is stipulated as a lenient standard.

But, the said figure is derived from a practical investigation on plywood production situations and in these rapidly progressive and remarkably vicissitudinary years, it can not be considered that the said 16 percent of moisture content would be maintained permanently.

Consequently, personnels of Japan Plywood Inspection Corporation in the charge of practice of Grading Rule as well as plywood manufacturers as a matter of course must carry out guidance to produce plywood having a moisture content of 14 percent or less.

(5) Other cautious matters for performing the tests:

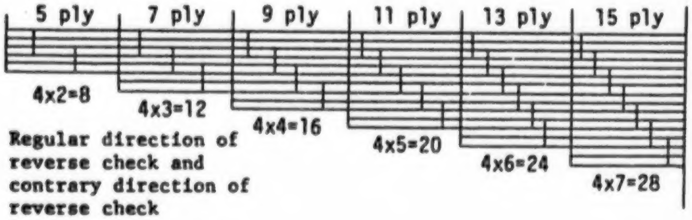
(a) In some occasion, a regular direction or a contrary direction to reverse check for a test piece which is employed to tensile strength test can not be manifestly identified. So, in occasion that test pieces are prepared from above plywood, grooves shall be alternately cut on top surface of test piece and then on back surface of the test piece.

(b) A groove cutting procedure for the test piece which is employed to the tensile strength test affects greatly measurement of tensile strength. So, the test piece for the tensile strength test shall be exactly prepared in accordance with the standard form.

(c) In respect to preparation of test piece for tensile strength test, a test piece of multi-laminated plywood, other than three laminated plywood, shall be prepared as a three laminated test piece so as all these three laminated test pieces may contain exhaustively any optional adherred layer of the said multi-laminated plywood.

In this occasion, four test pieces, in the other words two test pieces containing the regular direction of reverse check and another two test pieces containing the contrary direction of reverse check shall be prepared for one adhesive layer of the multi-laminated plywood.

This preparation procedure is illustrated by referring to the following figure.



Regular direction of reverse check and contrary direction of reverse check

(d) A tensile strength testing machine which is fitted with a dial scale by an unit of 1 kg or less or an unit of 2 lbs or less shall be used as a rule.

In this occasion, if a needle indicating a load acted on a test piece designates a figure between one unit and another unit of the dial, a fraction is disregarded and a lower figure is chosen for an adhesive strength of the test piece.

(e) A test piece for a tensile strength measuring test or a moisture content measuring test or a soak delamination shall be prepared so as it may not contain these defects such as knot, decay, pitch pocket or the like.

(f) A test piece for a tensile strength measuring test shall be prepared so as a length of the said test piece may be parallel to a main grain direction of a facial sheet and a thickness of veneer sheet shall be correctly measured by a minimum unit of 1/20 mm.

(g) In occasion that an adhesive strength is calculated, it shall be calculated by a minimum unit of 0.1 and a fraction of 0.5 or more is raised to 1.0 and a fraction of 0.4 or less is discarded.

(h) A test piece for a moisture content measuring test shall be prepared so as it may have a weight of 15 gram or more.

(i) A weight of the test piece for the moisture content measuring test shall be measured with gram unit and the said weight shall be measured by a minimum unit of 0.01 gram.

(j) A moisture content shall be calculated by a minimum unit of 0.1 and a fraction of 0.2 or less is discarded and a fraction of 0.3 or more is raised to "0.5."

(k) In occasion that a test piece for tensile strength measuring test or soak delamination test is dried, a relative humidity in a thermostatic dryer shall be considered and thereby a thermostatic dryer having a sufficient size and an effective capacity, so as moisture contents of all inserted test pieces in the said dryer may be reduced below initial moisture contents is preferably used.

(l) A delaminated length of the test piece as a result of soak delamination test shall be measured for total length of delamination.

(m) A tape coated part of the prepared test piece for plywood Type I is not regarded as a defect.

FORMS AND MARKING METHODS
FOR
STANDARD CERTIFICATES OF PLYWOOD

(EXCEPT AIRCRAFT USE PLYWOOD)

COMMON PLYWOOD

Institution : The Institution is based on
Ministry of Agriculture & Forestry,
Notification #288, 1 August 1950

. . . . . Intermediate partial Amendments are abbreviated . . . . .

Partial Amendment : The Partial Amendment is enacted by
Ministry of Agriculture & Forestry,
Notification #1059, 30 September 1961

Partial Amendment : The Partial Amendment is enacted by
Ministry of Agriculture & Forestry,
Notification #384, 11 April 1964

Amendment : The Amendment is enacted by
Ministry of Agriculture & Forestry,
Notification #163, 9 February 1966

II. FORMS AND MARKING METHODS FOR STANDARD CERTIFICATES OF COMMON PLYWOOD

1. Forms

(1) In the following figure, a length of A is specified as 15 mm or more and B is specified as 9/10 of the length of A.

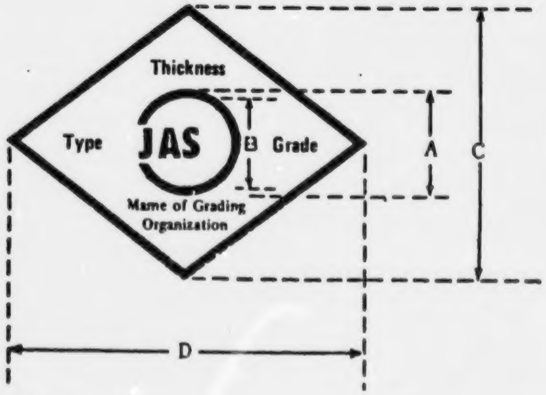
(2) In the same figure, C is specified as 2.6 multiples of the length of A and D is specified as 3.4 multiples of the length of A.

(3) A height of letters "JAS" is specified as 3/10 of the length of A and a height of letters of "Name of Grading Organization" is specified as 9/50 of the length of A and further a height of other letters is specified as 4/15 of the length of A, in the same figure.

(4) A width of lines of external frame is specified as 1/30 of the length of A.

(5) As type of plywood, Type I, Type II or Type III shall be described in this form.

(6) As grade of plywood, a grade for quality of facial sheet of plywood shall be described in this form. But, for a plywood in accordance with note 2, Paragraph 2-1, Article 4, the Japanese Agricultural Standard of Common Plywood (Ministry of Agriculture & Forestry, Notification #383), a grade of "Blank board" shall be marked in this form.



2. Marking methods

In each grading opportunity, a marking label shall be affixed or a marking stamp shall be given on an easily visible portion of each plywood sheet or each plywood package.

(Commentary)

Since previous years, a transaction of plywood by correct volume has been emphasized and according to the amendment of the Notification in 9 February 1966, a marking of thickness which has been desired among the concerned personnels was additionally stipulated and this enactment was carried out from 5 March 1966.

Thus, a standpoint which is able to guarantee a thickness of plywood, so far as the Standard defines, is manifestly fixed with "JAS Mark."

A color and a size of certificate can be optionally chosen, if an outside diameter of circle is in the excess to 15 mm and further, an inside diameter of the circle, a height and a width for an external frame and heights for letters of "JAS," letters of "Name of Grading Organization" and other letters have specified ratios to the said outside diameter of circle; and thus, the marking can be given optionally without limitation.

Further, as a marking method, a label or a stamp can be optionally chosen, but it goes without saying that letters for the markings can be manifestly, confirmatively read.

Furthermore, Japan Plywood Inspection Corporation is able to consider a colored label which conforms to a desirable label of merchandise for each manufacturer and thereby, the said corporation prints this colored label and use it for the marking.

Moreover, authorized plants are able to design dextrously "JAS Marks" which are combined with "Trade mark labels" of own companies and then, the said authorized plants can request to print them to Japan Plywood Inspection Corporation. In the other words, the authorized plants are able to perform effective movement of public relation by using an effective marking of "JAS Mark."

Further, if a stamping mark is particularly desired from economical viewpoint and operational promptitude such as revealed on "Approved plywood having 2.7 mm of thickness," a stamp having "JAS Mark" alone or a stamp having "JAS Mark" combined with "Trade Mark" of own company can be optionally used.

As described previously, "JAS" is an abbreviated letter of "Japanese Agricultural Standard" and a purpose for enacting the said standard comprises an improvement of plywood quality, a sound management of its production, simplification and justification of its transaction, and a sound utilization of this finished product.

In order to achieve above purpose practically, manufacturers, dealers transacting plywood, and consumers must understand well and use this standard.

For the sake of above mentioned purpose, common plywood shall be graded, transacted and used on the basis of "JAS" standard.

"JAS Mark" is a common standard in a field of production-Transaction-Consumption. In the other words, the "JAS Mark" expresses manifestly an adhesion degree, a moisture content and a quality of veneer surface and it is an important mark which is a postulate to an impartial transaction and a sound consumption as a right material in right place."

[An Example for "JAS Mark" of Common Plywood]

"JAS Mark" employed currently by Japan Plywood Inspection Corporation. (JAS Mark alone is employed.)

(1) Label Marking:

(a) A size of label: 45 mm (Length) x 60 mm (Width)

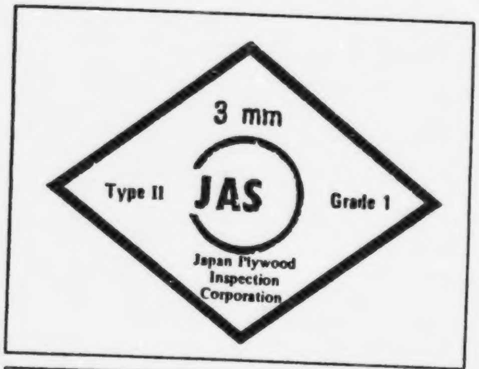
(b) A circle has 15 mm of outside diameter and 0.7 mm of rim width and letters for JAS have 4.5 mm of height. Lines of external frame have 0.5 mm of thickness and the said external frame has 39 mm of height. A tansversal width is 51 mm and letters for Grading Organization have 3 mm of height and other letters have 4 mm of height.

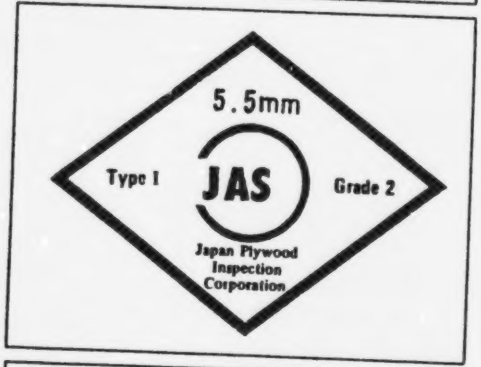
(c) While color is used for all letters and a color of paper except the color of the letters has a hue, a saturation and a lightness as shown in the following Table.

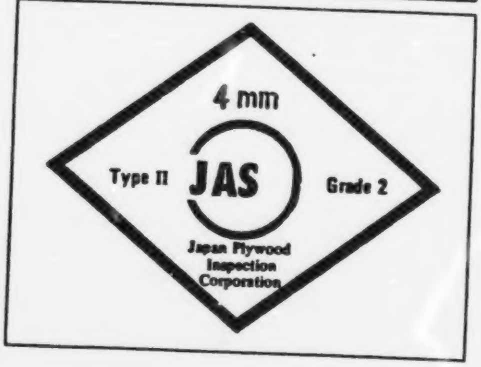
Kind of adhesiveness	Standard color	Remarks
Common plywood, Type I	Hue:20;Saturation:4;Lightness:13	Hue, Saturation and lightness shall be accorded with the Specification of JIS-Z-8901 i.e.Specification of marking method of XYZ color system.(JIS means Japanese Industrial Standard)
Common plywood, Type II	Hue:13;Saturation:4;Lightness:13	
Common plywood, Type III	Hue:16;Saturation:6;Lightness:16	

Note: In this occasion, the marking shall be performed by the mark of Japan Plywood Inspection Corporation alone, in the other words, by the individual mark of "JAS Mark" which is free from Trade mark of own company.

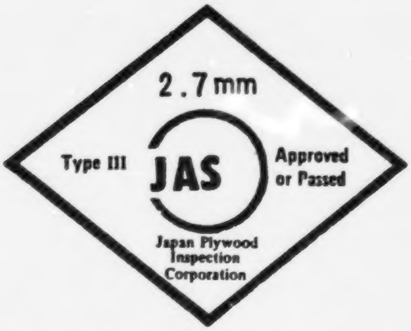
A color and a size for the "JAS Mark" which is specified to have 15 mm or more of external diameter can be optionally chosen by the authorized plywood plant.


3 mm
Type II
JAS
Grade 1
Japan Plywood
Inspection
Corporation


5.5mm
Type I
JAS
Grade 2
Japan Plywood
Inspection
Corporation


4 mm
Type II
JAS
Grade 2
Japan Plywood
Inspection
Corporation

(2) Stamp Marking:



(a) Above circle has 19 mm of external diameter and 0.95 mm of thickness. The letters of "JAS" has 5.7 mm of thickness and lines of external frame has 0.63 mm of thickness. The external frame has 49.4 mm of height and 64.6 mm of width. The letters for Name of Grading Organization have 3.42 mm of height and other letters have 5.06 mm of height.

(b) As flesh colored stamp, violet color is used.

An organization who is authorized to give "JAS Mark" is stipulated in accordance with Standard Law of Agriculture and Forestry Commodities and it is limited as organizations of prefectural governments (Tokyo Metropolitan Gov't and Hokkaido Prefectural Gov't are included) and organization of national government and Registered Grading organization. Further, employment of ambiguous mark which can not be discriminated from "JAS Mark" is prohibited.

At present, Japan Plywood Inspection Corporation, a Foundation alone is registered in Ministry of Agriculture and Forestry as a plywood grading organization on the basis of Standard Law of Agriculture and Forestry Commodities.

The marking of "JAS Mark" by the JAS authorized plants which is accorded with authorization directive for manufacturers of common plywood, in the other words, Notification of Ministry Vice Minister, #3543, 39 Economical Bureau - A, Ministry of Agriculture and Forestry, 12 May 1964 is one kind of the marking methods which is responsible for the registered grading organization, i.e. Japan Plywood Inspection Corporation. This is based on a palliative grading method in accordance with Grading Method of Common Plywood by Ministry of Agriculture and Forestry, Notification #496, 11 May 1964.

In respect to the marking method of "JAS Mark" on plywood, it is essentially desired to give the marking on each veneer sheet, but if it is not possible to give the marking on each sheet of "Both surface employable plywood" and "Blank board plywood," the marking is allowed to give on each package of plywood.

List for Location of Japan Plywood Inspection Corporation, Headquarters, District Offices and Detachments

Date: 1 March 1972

Names	Location (Address)	Area in the charge thereof
Headquarters	Meisan Bldg., #17-18, 1-chome, Nishi-shimbashi, Minato-ku, Tokyo, Japan Tel: Tokyo 03-591-7438	All Japan
Laboratory attached to Headquarters	#409, Nishinumata, Yatsuka-cho, Soka City, Saitama Prefecture, Japan Tel: Soka 0489-22-5671	
Hokkaido Inspection District Office	Satsutsu Bldg., #2, 6-chome, Nishi, Kita 5 jo, Sapporo City, Japan Tel: Sapporo 011-221-5603	All circles in Ishikari, Shiribeshi, Sorachi, and Rumoi
Kitami Inspection Detachment	Kitami Forestry Hall, 2-chome, Kita 4 jo, Kitami City, Japan Tel: Kitami 01572-3-3034	All circle in Abashiri
Obihiro Inspection Detachment	Obihiro Forestry Hall, #12, 9-chome, Minami, Higashi 2 jo, Obihiro City, Japan Tel: Obihiro 01552-3-4946	All circles in Tokachi, Kushiro and Nemuro
Asahigawa Inspection Detachment	Asahigawa Forestry Hall, #10, Hidari, Higashi 6-chome, 1 jo, Asahigawa City, Japan Tel: Asahigawa 0166-22-0546	All circles in Kamikawa and Soya

Names	Location (Address)	Area in the charge thereof
Tomakomai Inspection Detachment	Tomakomai Forestry Association Bldg., #4-4, Suehiro-cho, Tomakomai City, Japan Tel: Tomakomai 01442-2-3228	All circles in Hidaka and Iburi
Hakodate Inspection Detachment	Hakodate Lumber Hall, #26-11, Wakamatsu-cho, Hadodate City, Japan Tel: Hakodate 0138-22-4004	All circles in Toshima and Hiyama
North Eastern Inspection District Office	#5-16, Kaiunbashi Dori, Morioka City, Japan Tel: Morioka 0196-22-8033	Miyagi Prefecture, Aomori Prefecture and Iwate Prefecture
Akita Inspection Detachment	Forestry Hall, #1-9, 3-chome, Akita City, Japan Tel: Akita 0188-32-5771	Yamagata Prefecture and Akita Prefecture
Tokyo Inspection District Office	Nitta Bldg., #2-1, 8-chome, Ginza, Chuo-ku, Tokyo, Japan Tel: Tokyo 03-571-9961	Tokyo Metropolitan and Kanagawa, Saitama, Gumna, Chiba, Tochigi, Ibaraki, Niigata and Fukushima Prefectures
Shizuoka Inspection District Office	Shizuoka Prefectural Lumber Hall, #1-17, Sumpu-machi, Shizuoka City, Japan Tel: Shizuoka 0542-54-5386	Shizuoka, Yamanashi and Nagano Prefectures
Nagoya Inspection District Office	Japan Export General Merchandise Center, #2, 6-chome, Furusawa-cho, Naka-ku, Nagoya City, Japan Tel: Nagoya 052-331-1866	Aichi, Gifu, Mie, Toyama and Ishikawa Prefectures

Name	Location (Address)	Area in the charge thereof
Osaka Inspection District Office	#20, 2-chome, Kitajima-cho, Sumiyoshi-ku, Osaka City, Japan Tel: Osaka 06-685-0255	Osaka, Kyoto, Shiga, Fukui, Nara, Wakayama, Hyogo, Tokushima, Kagawa, Ehime, Kochi, Hiroshima and Okayama Prefectures
Chugoku Inspection District Office	#6-4, 2-chome, Kitahommachi, Imaichi-cho, Izumo City, Japan Tel: Izumo 0853-21-3280	Shimane Prefecture and Tottori Prefecture
Hiroshima Inspection Districe Office	#6-24, 1-chome, Tokaiichi-machi, Hiroshima City, Japan Tel: Hiroshima 0822-32-1508	Okayama and Hiroshima Prefectures and one part of Yamaguchi refecture, including three cities of Hikaru, Yanai and Iwakuni and three provinces of Naka Kumage and Oshima
Kyushu Inspection District Office	House Corporation, Kiyotaki Bldg., Kiyotaki-machi, Moji-ku, Kitakyushu City, Japan Tel: Moji 093-32-3434	Fukuoka, Sage, Nagasaki, Kumamoto, Kagoshima, Miyazaki, Ohita, and Yamaguchi Prefectures
Hiroshima Flooring Branch Office	#8-42, Nishi 3-chome, Ujina, Hiroshima City, Japan Tel: Hiroshima 0822-51-7996	Okayama, Hiroshima and Yamaguchi Prefectures
Matsuyama Flooring Branch Office	#6-3, 2-chome, Sanzu, Matsuyama City, Japan Tel: Matsuyama 0899-51-2222	All circles in Shikoku